

US Army Corps
of Engineers
Portland District

PUBLIC NOTICE
ENVIRONMENTAL ASSESSMENT
CASPIAN TERN RELOCATION FY 2000 MANAGEMENT PLAN
& PILE DIKE MODIFICATION
CLATSOP COUNTY, OREGON & GRAYS HARBOR COUNTY, WASHINGTON

CENWP-PM-E-00-02

Issue Date: January 19, 2000

Expiration Date: February 18, 2000

30 Day Notice

Interested parties are hereby notified that the U.S. Army Corps of Engineers, Portland District, proposes to participate in the relocation of a Caspian tern colony from Rice Island, near rivermile 20 of the Columbia River to East Sand Island, rivermile 5, in Oregon. The Corps' work will consist of habitat modification on the eastern end of East Sand Island, plus activities to prevent Caspian terns from nesting on Rice Island, Miller Sands Spit and Pillar Rock. Other Federal agencies plan to participate in related actions, including passive and active measures to encourage Caspian terns to nest at East Sand Island and to discourage nesting of Caspian terns returning to Rice Island. Monitoring and evaluating the relocation effort is also proposed. The Washington Department of Fish and Wildlife proposes to modify habitat on a recently accreted island in Grays Harbor to encourage Caspian terns to return and nest in the area. The proposed action was developed by the Caspian Tern Working Group, an inter-agency group consisting of participants from the Corps, the National Marine Fisheries Service, the U.S. Fish and Wildlife Service, Bonneville Power Administration, Oregon Department of Fish and Wildlife, Oregon Division of State Lands, Washington Department of Fish and Wildlife, the Columbia River Inter-Tribal Fish Commission (CRITFC), and research staff from CRITFC and Oregon State University. The Corps plans to modify 12 pile dikes in the Columbia River estuary to discourage cormorants from roosting there.

The FY 2000 Management Plan follows the pilot plan implemented in 1999. That action resulted in a portion of the Caspian tern colony moving from Rice Island to nest at East Sand Island. The present action is required in the 1999 Biological Opinion on the Corps' Columbia River Channel Operation and Maintenance Program.

Environmental Documents: A draft Environmental Assessment addressing the impacts associated with the activity is enclosed for public review and comment.

State Water Quality Certification: State Water Quality Certification, pursuant to Section 401 of the Clean Water Act, is not required as no fill in waters of the United States is proposed.

Coastal Zone Management Act of 1972: A consistency determination, prepared for the 1999 pilot project, was concurred with by the Oregon Department of Land Conservation and Development. The Federal actions for the FY 2000 Management Plan are similar to those described in the 1999 pilot project.

Additional Information and Comments: Questions or comments regarding the enclosed environmental document should be directed to Bob Willis, telephone (503) 808-4760, or Lynne Hamilton, 808-4772, or at the address below. Comments on this notice must be mailed by the above closing date to:

District Engineer
U.S. Army Corps of Engineer District, Portland
Attn: CENWP-PM-E
P.O. Box 2946
Portland, Oregon 97208-2946

In your response, please refer to the above public notice number, title and date.

Should no response be received postmarked by the above closing date, a "no comment" response will be assumed.

CASPIAN TERN RELOCATION FY 2000 MANAGEMENT PLAN
and PILE DIKE MODIFICATION TO DISCOURAGE CORMORANT USE
LOWER COLUMBIA RIVER
OREGON and WASHINGTON

DRAFT ENVIRONMENTAL ASSESSMENT

INTRODUCTION

Caspian tern breeding was first documented in the Columbia River estuary in 1984 when about 1,000 pairs were reported nesting on fresh dredged material on East Sand Island. Prior to 1984, the species was a non-breeding, summer resident of the Columbia River estuary. Most of the colony moved to Rice Island in 1986, probably because of vegetation development on East Sand Island. Rice Island was created from dredged material disposal, which began in 1962. The island has large, barren sandy areas due to continued disposal actions, which are attractive to nesting terns.

Because of concerns regarding avian (bird) predation on outmigrating juvenile salmonids, the March 2, 1995 National Marine Fisheries Service (NMFS) Biological Opinion on Operation of the Federal Columbia River Power System (1995 Biological Opinion) included as Incidental Take Provision #9 the requirement that the US Army, Corps of Engineers (Corps) “conduct studies to identify (a) Caspian Tern predation of juvenile salmonids, and (b) methods to discourage tern nesting.” A Biological Opinion signed September 15, 1999 on Corps of Engineers' Columbia River Channel Operation and Maintenance Program addressed both Caspian tern and cormorant concerns, and included in sub-section C. Terms and Conditions:

1a. The COE shall modify the habitat on Rice Island by April 1, 2000, so that it is no longer suitable as a nesting site for Caspian terns or provide for the hazing of terns off the island in a manner that will preclude their nesting. The COE shall ensure that any terns hazed off the island do not nest on any dredge spoil islands in the action area (other than East Sand Island). The COE shall continue to prevent nesting of Caspian terns on disposal islands within the action area for the life of the project.

1b. The COE shall work with NMFS to identify methods to prevent cormorant usage of COE maintained pile dikes. The COE shall then modify these pile dikes so that they are unable to be utilized by cormorants for resting and loafing or as feeding platforms. The COE shall modify COE maintained pile dikes located in the Columbia River Estuary around Rice Island, Miller Sands and East Sand Island by April 1, 2000. The COE shall monitor the success of the efforts in preventing cormorant usage in that area during the spring and summer of 2000. If the techniques are successful, the COE shall begin modifications on all COE maintained pile dikes throughout the action area in coordination with NMFS. If the techniques are unsuccessful, the COE shall further coordinate with NMFS to develop other methodologies of prevention.

Research on Caspian tern foraging ecology began in 1996 in response to the 1995 Biological Opinion. Research was conducted by Oregon State University (OSU) and Columbia River Inter-Tribal Fish Commission (CRITFC). Research results indicated the colony has grown rapidly. The colony size was estimated to be about 7,000 breeding pairs in 1997 and about 8,000 breeding pairs in 1998. There were about 8,100 breeding pairs at Rice Island in 1999 plus 1,400 breeding pairs at East Sand Island. Some of the pairs on East Sand Island were failed breeders from Rice Island, thus the total breeding population in the Columbia River estuary in 1999 was probably about 9,000 pairs. During the nesting season, Caspian terns in the Columbia River estuary consumed large amounts of salmonid smolts in 1997 (6 to 25 million) and 1998 (7.4 – 15.2 million).

Consequently, NMFS requested immediate remedial action to lessen impacts to salmonids. A multi-agency working group, the Caspian Tern Working Group (CTWG) was formed in May 1998 to develop a short-term plan for reducing salmon predation by Caspian terns nesting at Rice Island to be implemented before the 1999 juvenile salmonid out-migration. A system-wide, long-term plan to reduce predation by piscivorous (fish-eating) birds (terns, cormorants and gulls) on juvenile salmonids was an objective of this group.

A short-term “pilot” plan was developed and implemented in 1999. The plan consisted of seeding and installing silt fences on all but 1 acre of the 8-acre nesting site on Rice Island (to provide for 1,000 pairs of nesting terns) and creating nesting habitat on East Sand Island. (A little more than 8 acres were cleared of vegetation at East Sand Island.) Tern decoys and recorded calls were utilized to attract terns to nest on East Sand Island. An environmental assessment was released for public review on October 29, 1998, and a Finding of No Significant Impact was signed January 15, 1999.

The pilot project had some success: about 2,800 terns nested on East Sand Island in 1999. Their overall seasonal diet consisted of 44 percent salmonids, compared to 75 percent for those terns nesting on Rice Island. An estimated 8,100 pairs of terns nested on Rice Island in 1999. This was about the same number as nested there in 1998, although the nesting area was reduced to a little more than 1 acre, and the birds were harassed until nesting began. There was heavy predation on tern eggs and chicks by gulls at Rice Island in 1997 and 1998, however gull predation was reduced in 1999 as tern nesting density was increased in response to the reduced acreage available for nesting activities. Very little gull predation occurred at East Sand Island in 1999, attributable primarily to the removal of problem gulls in order to enhance successful establishment of a colony.

Data from the short-term pilot project to reduce avian predation were considered in developing the fiscal year (FY) 2000 plan, and will be considered in developing any long-term plan. Much of the data presented in this document is from the 1999 Environmental Assessment on the Caspian Tern Pilot Project; the 1997 Annual Report and the 1998 draft Annual Reports on Avian Predation on Juvenile Salmonids in the Lower Columbia River (Roby et al., 1998, Collis et al., 1999); and from preliminary data from 1999 research efforts by OSU/CRITFC.

NEED FOR ACTION

Of 20 evolutionarily significant units (ESU) of naturally produced anadromous salmonids in the Columbia Basin, three are listed as endangered, nine are listed as threatened, one is proposed to be listed within the year and one is under review. Six ESUs have been determined as unwarranted

for listing. Two of these six ESUs, the Wenatchee and Okanogan sockeye salmon, represent rapidly declining stocks.

Results of OSU-CRITFC research indicate that the nesting colony of Caspian terns located at Rice Island in the Columbia River consumed 6 to 25 million salmonid smolts in 1997. This represents about 6 to 25 percent of the 100 million out-migrating smolts that reached the estuary or 3 to 12 percent of the 200 to 250 million smolts produced basin-wide. In 1998, the estimated consumption of juvenile salmonids by Caspian terns in the Columbia River Estuary was 10.8 million (range = 7.4 to 15.2 million), or about 11 percent (range = 8-16 percent) of the estimated 95 million out-migrating smolts that reached the estuary during the 1998 migration year. These estimates represent only the consumption by Caspian terns associated with major colonies in the estuary during the breeding season. Caspian terns and other seabirds, primarily double-crested cormorants and several species of gulls, consume many more millions of smolts in the estuary as well as at other locations and during other time periods along the Columbia River.

The peak migration period of juvenile salmonids coincides with the nesting and rearing season of the terns. Additionally, Rice Island is located near the furthest upstream intrusion of salt water into the estuary. Smolts may delay before entering salt water or may move into the fresh water lens that “floats” on the denser saltwater. Estimates in 1997 and 1998 are that the tern colony consisted of 7,000 and 8,000 nesting pairs of birds, respectively. In 1999, the tern colony on Rice Island was about 8,100 nesting pairs, with an additional 1,400 pairs diverted to East Sand Island. Salmonids comprised 77 percent of the diet composition of Caspian terns nesting at Rice Island whereas salmonids only represented 44 percent of the diet by prey item at East Sand Island. The pilot project did demonstrate that it is possible to shift nesting terns to a different colony site and that their harvest of juvenile salmonids could be reduced by moving them to sites nearer the ocean where other prey species are available.

Resource agencies, including the NMFS, Oregon Department of Fish and Wildlife (ODFW), Washington Department of Fish and Wildlife (WDFW) and Idaho Department of Fish and Game (IDFG), are concerned that this level of predation is injurious to species and stocks of salmonids listed under the Endangered Species Act. NMFS estimates that 250,000 fish of listed stocks were taken in 1997 by Caspian terns using the “best” estimate of the number of juvenile salmonids taken by terns during that year. Further, NMFS estimates that about 5,881,000 listed fish reached the estuary in 1999; this reflects in part a greater number of listed stocks in 1999 for the Columbia River basin (Herb Pollard, NMFS, pers. comm.) (see Table 3) Applying the mean consumption rate of 11 percent, about 647,000 of the listed salmonids could have been taken by Caspian terns in 1999.

Certain listed stocks have been incorporated into the hatchery program to facilitate Columbia River salmonid recovery efforts. Some Upper Columbia River steelhead, nearly all Snake River sockeye, many Snake River spring-summer chinook and some Snake River fall chinook now originate from hatcheries. The hatchery components as well as the wild stocks are ESA listed. Some lower Columbia River summer and winter steelhead (Kalama, Sandy and Clackamas River) originate from hatcheries and are ESA listed. Cowlitz River re-introductions of winter steelhead and spring chinook are ESA listed. Hatchery chums (Grays and Elochoman River) are also ESA proposed stocks. Hatchery fish remain an important component of Columbia River salmonid recovery efforts.

Tens of thousands of PIT tags have been recovered from bird colonies in the estuary. Based on PIT tag recoveries on Rice Island, Caspian terns consume a higher proportion of available hatchery-raised smolts versus wild smolts in the Columbia River estuary, for some stocks in some years. PIT tagged hatchery-reared steelhead and spring/summer chinook were over-represented on colony as compared with their wild counterparts in 1997 and 1998, respectively. Double-crested cormorants, however, foraged on hatchery and wild smolts in proportion to their availability in the estuary (K. Collis and B. Ryan, in-progress unpublished data). These data suggest that hatchery smolts may be more surface oriented as compared to wild fish and therefore more susceptible to tern predation (i.e., terns forage at or near the surface, while cormorants forage throughout the water column).

Junge (1967) provides an argument that ocean survival is not density dependent and concludes "... that a reduction of smolts by a fraction m will on the average reduce the production of returning adults also by a fraction m ." While there is considerable debate about the effects of ocean conditions, and some more recent reviews attach some qualifiers to Junge's conclusion (Emmett and Schiewe, 1997), it is a central assumption behind most of the multi-million dollar Columbia Basin fish mitigation activities: If more live smolts can be delivered to the ocean, more adults will return. For example, the whole point of collecting and transporting smolts around the dams is to get more live smolts to the ocean. The goal of the northern pikeminnow control project is to get more live smolts through the system. The northern pikeminnow (formerly squawfish) control program is estimated to reduce predation on juvenile salmonids by 3 to 5 million annually. Smolt consumption attributable to Caspian terns in the Columbia River estuary was estimated at 10.8 million smolts for 1998. There is now very credible information (Roby et al. 1998; Collis et al. 1999) that many smolts are lost to avian predation in the estuary after being passed alive through the FCRPS by ongoing mitigation programs.

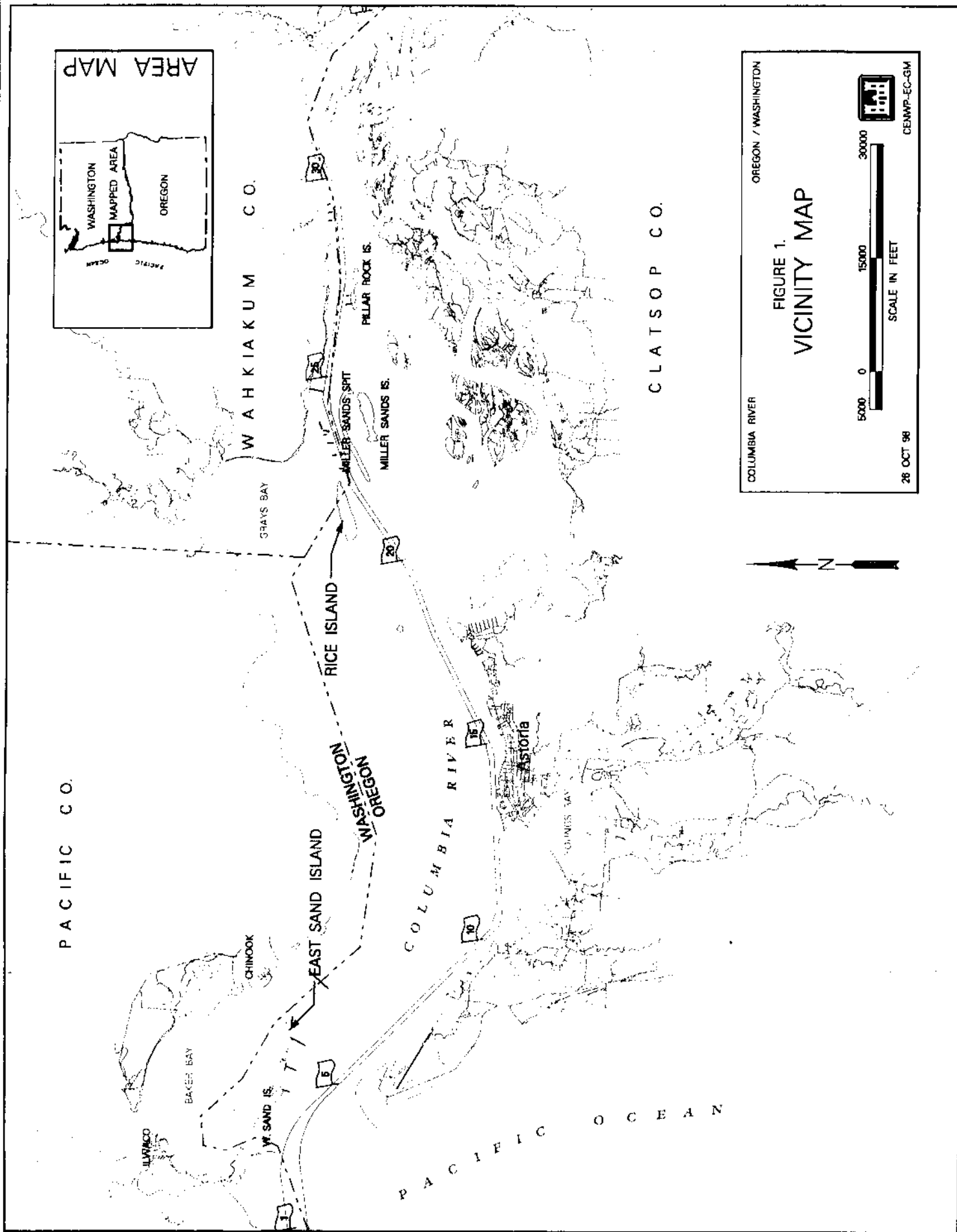
PIT tags were placed in smolts for research on passage and survival. Most (in the range of 90 percent) of the PIT tags recovered in the estuary were placed in fish in the Snake River basin and represent the survivors of a 625 to 940 mile migration. The avian predation research project indicates that between 10 and 30 million of these survivors are now consumed by avian predators as they complete one of the most hazardous stage of their complex life cycle.

Restoration of former Caspian tern colonies on East Sand Island (closer to the mouth of the Columbia River) and to islands in Washington estuaries where colonies formerly existed, would expand the diversity of prey species available for terns, thus reducing predation on salmonids. Restoration of tern colonies in coastal Washington, such as at Grays Harbor, also would result in less predation on listed species of salmonids in the Columbia River. Spreading out the birds to a number of colonies creates a more normal situation for the birds and reduces concentration of bird predation on certain fish runs.

PROPOSED ACTION and ALTERNATIVES

The proposed Caspian tern management objectives for 2000 arose from discussions within the Caspian Tern Working Group. It is proposed to relocate the entire Caspian tern colony presently nesting at Rice Island, rivermile (RM) 21-22 of the Columbia River. Terns would be relocated to East Sand Island, near RM 5 of the Columbia River (Figure 1), and to Grays Harbor, Washington (Figure 2). (Terns could potentially be relocated to sites in South Puget Sound; however, while that is under study, it is not a part of the FY 2000 plan.) Management actions would be monitored

and evaluated so that future management initiatives can be developed and improved. The FY 2000 management plan is designed to achieve the short-term goal of a substantial reduction in losses of out-migrating smolts while making progress toward the long-term goal of dispersing Caspian terns into smaller colonies spread over a wide geographic area.



COLUMBIA RIVER

OREGON / WASHINGTON

FIGURE 1.

VICINITY MAP

5000 0 15000 30000

SCALE IN FEET

28 OCT 96

CEAMP-EC-GM

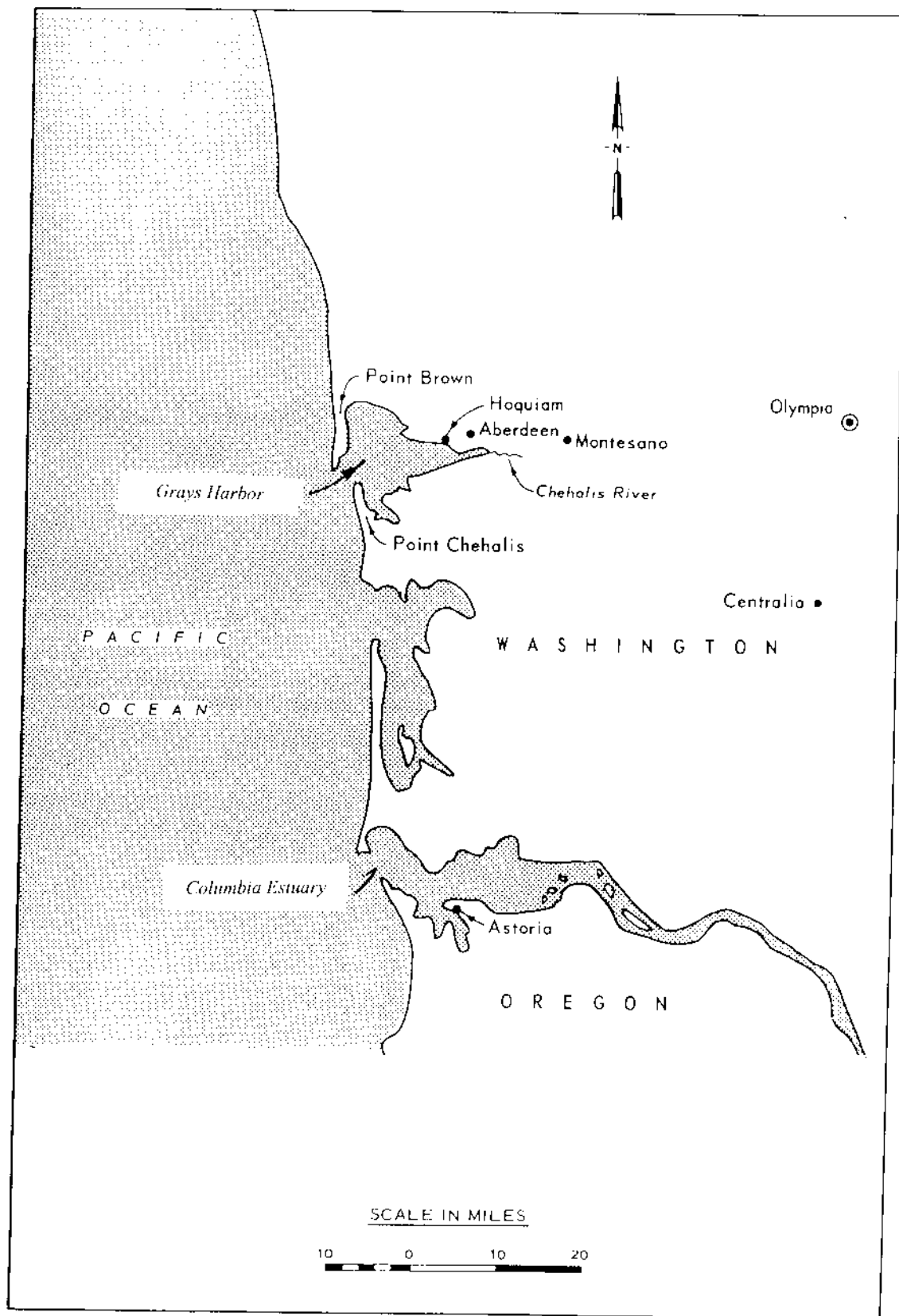


Figure 2 Columbia River Estuary & Grays Harbor

East Sand Island was used by nesting Caspian terns from 1984-1986, and about 1,400 pairs nested there in 1999. The Caspian Tern Working Group provided input to the 1999 action, which was developed as a pilot study to determine if the tern colony can be moved, and if relocation of the colony would reduce predation on outmigrating salmonid smolts. The outcome of that action led to the present proposed action, elements of the which are displayed in Table 1.

Table 1- Action Matrix

Proposed Action	Rice Island	Miller Sands Spit	Grays Harbor	East Sand Island
Nesting Habitat Development and/or Maintenance – Tillage, Herbicides and Use of Social Attractions (Decoys and Recorded Calls).	Not Applicable	Not Applicable	Objective: Establish Caspian tern colony. Remove vegetation from portion of Cate Island (or other island); place decoys and recorded calls. Management of problem gulls unless colony exceeds 1980s levels (3000-4000pairs).	Objective: Establish Caspian Tern Colony. Action: Till 4 acres at u/s tip of island to provide suitable nesting habitat for Caspian terns; lure them to site. Implementation of tillage in winter; decoys/recorded calls begin late March. Management of problem gulls occurs spring.
Human Disturbance, silt fencing, plastic sheeting, application of adaptive management techniques to disperse Caspian terns. Fence 175 acres of open or sparsely vegetated area for potential future management.	Probable timeframe April 5-July 1. Objective: Preclude tern nesting. Action: Construct silt fencing or other physical features on entire 8-acre nesting site. Employ human disturbance at tern congregation locations. Intervention is very site specific and does not intrude upon majority of island acreage thus negligible impacts to other species. Will disrupt terns, cormorants and gulls at colony locations at Rice Island. Measure essential to accomplish tern relocation.	Probable timeframe April 5-July 1. Objective: Preclude tern nesting. Action: Employ human disturbance at tern congregation locations. Intervention is very site specific and does not intrude upon majority of island acreage, thus negligible impacts to other species. Will disrupt terns and potentially nesting gulls on Miller Sands Spit. Action necessary to preclude relocation of terns to Spit.	Not Applicable	Adaptive management measures may be employed, e.g., in-season harassment of nesting terns, suspension of gull control activities.

Objectives and strategies to accomplish the proposed action are outlined in the following text.

Objective 1. Move Caspian terns away from Rice Island and the upper estuary islands towards marine habitat as quickly as possible. Objective 1 will be accomplished by simultaneously precluding terns from nesting in areas on or near Rice Island while actively attracting them to nest at alternative sites both in the lower estuary (East Sand Island) and along the Washington coast.

Objective 2. Encourage emigration of terns from nesting sites within the Columbia River estuary (i.e., East Sand Island) to areas outside the estuary. Objective 2 will be accomplished by implementing in-season adaptive management to encourage terns attempting to nest on East Sand Island to move to nest sites located outside the estuary. An adaptive management approach is recommended due to the uncertainty surrounding the outcomes of each of the management strategies described below.

Five general implementation strategies were set out in the FY 2000 Tern Management Plan - Caspian Tern Predation on Juvenile Salmonids in the Columbia River Estuary to attain these two objectives.

Strategy 1. Prevent all nesting by Caspian terns on Rice Island and other dredged material islands in the upper estuary in 2000.

Approximately 8,000 pairs of terns nested on Rice Island in 1998 and 1999. Methods used to prevent nesting may include fencing the entire Rice Island colony area and/or persistent, intensive harassment of terns attempting to nest or roost on islands in the upper estuary. Destruction of nests and eggs is a potential method that can be employed and if warranted by failure of other methods.

Strategy 2. Caspian terns that formerly nested on Rice Island will be attracted to nest on East Sand Island in the lower estuary. Management of nesting habitat and social attraction techniques will be used to draw terns away from the Rice Island area toward more marine habitats. A total of 4 acres of suitable tern nesting habitat will be provided on East Sand Island in FY 2000. This is a significant reduction from the approximately 8 acres of tern habitat that was created in 1999. Four acres is sufficient habitat to accommodate 80 percent of the tern population in the Columbia River estuary if terns nested at the same densities observed on East Sand Island in 1999. A colony of 1,400 pairs nested on East Sand Island in 1999 and consumed 41 percent fewer juvenile salmonids compared to those nesting on Rice Island.

Strategy 3. Caspian tern colony sites will be restored at coastal sites outside the Columbia River estuary. One colony site in Grays Harbor has been identified and two other potential sites are being investigated (one in Grays Harbor and one in South Puget Sound) for restoration using habitat manipulation and social attractions techniques. These restored colonies will be used to draw as many terns as possible away from the colony site at East Sand Island in the Columbia River estuary.

Strategy 4. Further incentive for terns to emigrate to restored colony sites outside the estuary will be provided by in-season adaptive management at the East Sand Island colony.

If most terns relocate to East Sand Island early in the nesting season and there are small numbers of terns attempting to nest outside the estuary, efforts to encourage greater movement of terns from East Sand Island to alternative colonies outside the estuary may be considered. An adaptive management approach will be used due to the uncertainty surrounding the outcomes of each of

the management strategies. For example, if efforts to move terns out of the Rice Island/upper estuary area are only moderately successful, then it is likely that any attempts to discourage tern nesting on East Sand Island would be counterproductive (i.e., terns disperse from East Sand Island and return to the upper estuary). Methods that may be deployed include in-season harassment of terns and suspension of gull control activities both outside and inside the core nesting area. Decisions to implement in-season management at East Sand Island will depend on many factors and whether those actions are likely to lead to further movement of terns outside the estuary and greater reductions in smolt consumption in the Columbia River estuary.

Strategy 5. Data will be collected throughout the nesting season in order to constantly monitor and evaluate management actions. These data will provide the basis for both in-season adaptive management decisions, as well as the development of a long-term plan to reduce smolt losses to avian predators in the Columbia River estuary. Tern distribution, dispersal patterns, and diet will be closely monitored so that managers have the best information on which to base in-season management decisions.

To accomplish relocation, suitable nesting habitat, in conjunction with social attraction measures (e.g., decoys, recorded tern calls), will have to be employed at East Sand Island and at other nesting habitat locations in Grays Harbor. Habitat management actions at East Sand Island would entail preparation of 4 acres of bare sand at the upstream tip of the island. The objective is to maintain a bare sand environment suitable for nesting Caspian terns. The 4 acres of nesting habitat are estimated to be capable of supporting 80-100 percent of the estuary tern population, depending on nest densities. Nesting habitat actions (4 acres) would occur within the 8 acres cleared in 1999 for tern management that have since re-vegetated. Disking and tillage, possibly after application of herbicide, would remove the present vegetative growth. Decoys and a sound system to play back recordings of Caspian tern colony calls would be placed at the constructed nesting site to attract terns. Maintenance actions for 4 acres of tern habitat at East Sand Island are to be conducted by the Corps with funds provided by the U.S. Fish and Wildlife Service.

Hazing will be the principal management measure employed to prevent tern nesting and roosting at--and to discourage the birds from remaining in the vicinity of-- Rice Island, Miller Sands Spit and Pillar Rock Island. Habitat alteration, that addresses the 8-acre nesting area at Rice Island, such as silt fences to establish cover not conducive to tern nesting may also be employed. Sturdy, wire fencing would be constructed around about 175 acres of sparsely vegetated disposed dredged material. This fence, which would be placed to allow for potential future management actions, would contain the hazing area and likely be constructed on existing berms surrounding the disposal area. Previous vegetation attempts on these islands have not been very successful, thus these other management techniques are proposed. Hazing of terns could include placement of eagle silhouettes, playback of tern "distress calls", and human interference, including use of ATVs to displace terns from the colony location. Hazing operations would begin on 1 April 2000 and continue through 1 July 2000, by which time most nesting attempts should cease. Personnel would be present each day, including weekends, during this timeframe to accomplish the effort. Daily, personnel would be present at Rice Island from dawn to dusk; presence at the other islands would be intermittent throughout the day and depend on level and nature of use by Caspian terns as determined in the field.

Concentrations of Caspian terns (e.g. greater than 25 birds) that occur at these islands, whether on the uplands or beaches, would be disturbed by direct human approach until Caspian terns

vacate the location. Human intrusion into areas and habitats not used by Caspian terns would be minimized to the extent practicable in order to avoid disturbance to other wildlife, including bald eagles, shorebirds, and waterfowl, including nesting Canada geese. Caspian terns typically occur in open sandy uplands and/or on beaches. Thus there is no necessity typically for personnel to enter vegetated habitats. Intrusions on Miller Sands Spit and at Pillar Rock Island are anticipated to be site specific and accomplished by running personnel to shore by boat at the location used by Caspian terns. Human presence on Miller Sands Spit and Pillar Rock Island should thus be of brief duration. Human presence at the downstream tip of Rice Island would be near full-time in order to keep Caspian terns from congregating on or near the previous colony site and/or on adjacent beach habitat. Since this population of terns is an increasing population, the loss is not significant. Under the Migratory Bird Treaty Act (MBTA), take of migratory birds is regulated by the USFWS. MBTA permits are not required to conduct non-lethal harassment. The USFWS regulations contain requirements for lethal take of migratory birds. The Corps' action will be consistent with the Migratory Bird Treaty Act (MBTA).

The proposed action to remove birds from Rice Island will require the removal of nest scrapes and eggs even with a high level of harassment to keep birds from nesting on Rice Island. This is based upon the experience in 1999 where active harassment was implemented to keep birds from nesting in two satellite colonies. Active harassment kept birds from one of these areas up to dusk one evening; when harassment was resumed early the next morning, the birds had already laid two eggs. For last year's activities, the agreement was that active harassment would cease upon the laying of eggs. Consequently, more birds nested on Rice Island than was preferred and it became apparent that even with the most intense harassment that it would be impossible to move the birds under a constraint of not taking any eggs.

The goal this year is to completely move birds from Rice Island. Consequently, harassment must be early and intensive, and cannot be stopped if nest scrapes are constructed and eggs are laid. It is very difficult to identify the specific level of egg take that will be required as part of this action since little experience is available in performing such actions. If the harassment is extremely effective, little nesting will occur on Rice Island and the take may only be a few eggs. However, for purposes of this environmental assessment, we will assume that the level of egg take may be up to approximately 300 eggs. The impact of such an action is, if done early in the breeding season, for the birds to re-lay later and nest somewhere else later. Eggs taken later in the breeding season may result in no production from that pair of birds.

In-season management at East Sand Island to aid emigration of Caspian terns to locations outside the Columbia River estuary will be implemented only if it is determined that the displaced terns will likely choose to relocate outside the estuary. Management methods employed may include human harassment of terns attempting to nest outside the 4 acres of managed habitat (where prospects of nesting are poor anyway) and suspension of gull control activities for all or most of the 4-acre tern nesting area. Decisions to implement in-season management at East Sand Island will be dependent on many factors, including success of preventing terns from using upriver locations and availability of suitable nesting habitat at other estuarine locations, such as Grays Harbor. Specific decisions will be made during the nesting season as information on other actions becomes available and analysis of efforts is ongoing. Monitoring will be conducted to document tern distribution, dispersal and diet composition for future management decisions.

Relocation of terns to colonies outside the Columbia River estuary to Grays Harbor and/or South Puget Sound will be dependent, in part, upon the availability of nesting habitat at these locations. Habitat development in these estuaries is dependent upon other Federal, and State, resource agencies. These Federal and State agencies, as members of the interagency Caspian Tern Working Group, have committed to provision of tern nesting habitat in these estuaries. Restoration of at least one Caspian tern colony outside the Columbia River estuary is considered a crucial component of the proposed management efforts for 2000. Attraction of terns to any proposed site cannot be guaranteed due to incomplete knowledge of tern breeding habitat selection. However, the provision of multiple nesting sites outside the Columbia River estuary should significantly increase the probability of success, i.e., decreasing smolt predation. Predictive model results presented to the Caspian Tern Working Group indicated that, "The greatest reductions in smolt losses to terns in 2000 and the most predictable outcomes were achieved by providing sufficient nesting habitat for the entire tern population on East Sand Island, at least early in the nesting season, and providing multiple alternative nesting sites outside the estuary, preferably nearby."

Intensive monitoring and evaluation of Caspian tern nesting success and consumption of salmonids would occur both in Oregon and Washington sites through an on-going research effort conducted by OSU-CRITFC and RealTime Research (RTR).

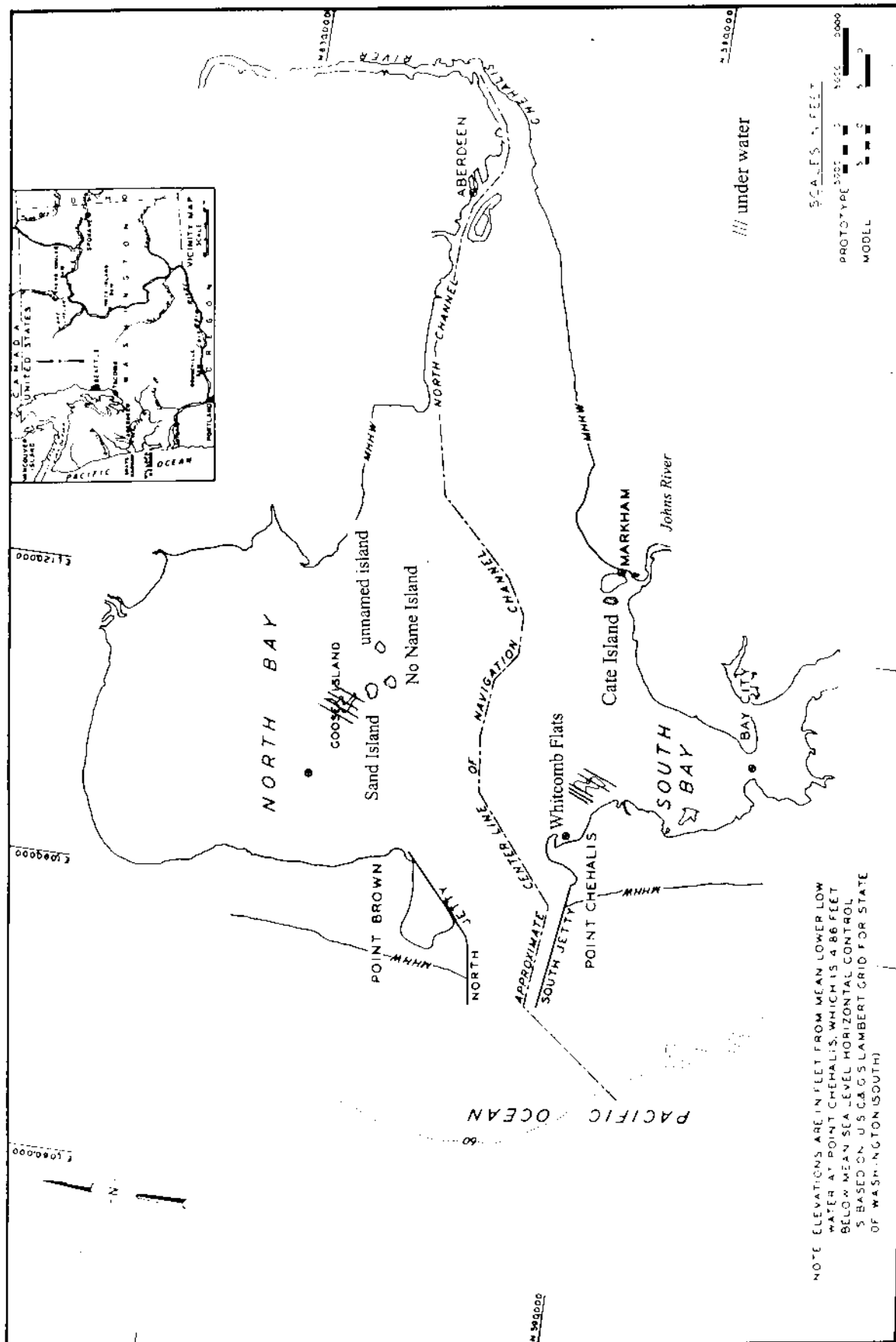
Habitat modification at East Sand Island and Rice Island would be accomplished by the Corps. Researchers associated with OSU-CRITFC would be responsible for placement of decoys and sound devices and their implementation at East Sand Island and Grays Harbor. Discouragement of nesting at Rice Island, Miller Sands Spit and Pillar Rock Island would be performed by the Corps through contracts.

Habitat modification in Grays Harbor would be accomplished by State resource agencies. Cate Island, a recently-accreted island in South Bay, is proposed for tern nesting. There are some sparsely vegetated, sandy areas along the north shore of Cate Island, areas that would require relatively little scarifying to provide suitable tern nesting habitat. Some habitat improvement using heavy equipment would be required, however. Approved herbicides would be used if needed. Cate Island is close to the Johns River boat ramp and thus relatively accessible for barging equipment to the island. Decoys and recorded bird calls would also be placed on the island. Control of predatory gulls would be implemented as necessary. Gull control would cease if nesting terns reach previous levels established in the 1980s (3,000 to 4,000 pairs). Sand Island, No Name Island, and another recently accreted island in North Bay are also possible sites for nesting, but presence of gulls and eagles make these less desirable than Cate Island. Whitcomb Flats was also considered; however, presently it is underwater for periods of the day. (Figure 3).

The USFWS would provide assistance for Migratory Bird Treaty Act issues. The proposed action and/or research efforts are also partially funded by the Bonneville Power Administration (BPA).

In addition to the proposed action to disperse Caspian terns, the Corps also plans to discourage cormorants from nesting at Rice Island and perching on 12 pile dikes in the Columbia River Estuary. Hazing actions at Rice Island to preclude Caspian terns will also preclude cormorant nesting at this location. The Corps will also address cormorant use of pile dikes. This action would entail the construction of features to preclude cormorants from perching on up to 9,590 lineal feet of pile dikes and 3,836 piling at 12 pile dike locations on the Columbia River from

approximately river mile 22 to 52. Pile dikes at East Sand Island were not included in 2000 management actions because double-crested cormorants at East Sand Island have a more diversified diet, and because piling there support a unique nesting colony of Brandt's cormorants. The Corps also needs to perfect the exclusion technique for pile dikes. Pile dikes selected for modification are those determined from researcher observations during 1998 and 1999 to host 50 or more perching cormorants per site visit. It is anticipated that spike strips or comparable devices, such as piling caps or wires, would be attached to the spreaders and pilings at these 12 pile dikes. These devices are intended to preclude double-crested cormorants from perching at these locations and thus reduce the efficiency of predation on juvenile salmonids. It is expected that there would be fewer juvenile salmonids consumed by cormorants if the birds had reduced



perching areas. This action is in response to NMFS 1999 Biological Opinion on the Corps' proposed Columbia and Lower Willamette Rivers Operation and Maintenance project.

Alternatives

One alternative to the proposed action is no action. Given the re-vegetation of the cleared site on East Sand Island, and the strong history of nesting on Rice Island, "no action" would probably see the return of most, if not all, of the terns to nest at Rice Island as they did in 1998.

Another alternative to phased dispersal of Caspian terns would be to eliminate all Caspian tern nesting in the Columbia Estuary in the year 2000. In addition to habitat modification and harassment at Rice Island, no vegetation removal would occur at East Sand Island, and harassment would occur there also if any terns attempted to nest. This alternative is not considered viable for several reasons. The terns have nesting fidelity to the Columbia Estuary sites and are expected to return there, as they have for 16 years. Most will attempt to nest at Rice Island, though some will have fidelity to East Sand Island and return to that site. While colonies have moved when habitat is lost, and nested at new sites (as this population has done in the 1970s and 1980s), to provide such a large colony no place to nest may lead to total reproductive failure in 2000, particularly if no other suitable nesting habitat is present in the region. Large numbers of terns might still feed on smolts in the Columbia River estuary in the absence of other suitable nesting locations. There could also be increased use of nesting sites further upstream on the lower Columbia River, including locations where the birds' presence is not desirable. This could result in greater consumption of anadromous fish than in previous years.

Predation by Caspian terns nesting at Rice Island is believed by NMFS to be so detrimental to the listed salmonids that no action or a further delay in phased dispersal attempts would adversely affect recovery of salmonid stocks listed under the Endangered Species Act of 1973, as amended. NMFS estimated that 250,000 fish of listed stocks were taken in 1997 by Caspian terns, based upon the "best" estimate of the number of juvenile salmonids taken by terns during that year. Approximately 647,000 listed fish may have been taken in 1999 by Caspian terns. This larger number reflects, in part, a greater number of listed stocks in 1999 for the Columbia River Basin. The estimates of avian predation are not sufficiently refined to evaluate impacts on individual stocks. With the recent listings, nearly all wild and naturally spawned steelhead and spring/summer chinook and some hatchery runs are listed. Data suggest that the larger steelhead and yearling chinook smolts seem to be the preferred targets of avian predators.

Results from the 1999 pilot study indicate that terns nesting at East Sand Island consume about 40 percent fewer salmonids than terns at the Rice Island colony. While dispersing most of the colony out of the Columbia River Estuary is a management goal, to provide no nesting area at all carries too great a risk that the entire colony will remain in the area, feeding on salmonids, but not nesting. This would cause loss of both terns (nesting failure) and listed salmonids.

One suggested alternative for hazing of terns on Rice Island is the presence of domestic pigs or other predators. While this alternative is not under active consideration for Rice Island for FY 2000, it will be reconsidered for implementation in 2001, if necessary.

AFFECTED ENVIRONMENT

Overview: Caspian Tern and Cormorant Populations

(The following description is excerpted from Collis et al. 1999, pp. 61-65)

“The Caspian tern colony on Rice Island, a dredged material disposal island in the Columbia River estuary, is currently the largest of its kind in North America (about 8,000 nesting pairs), and perhaps the world (Cuthbert and Wires 1999). This colony has increased by over 600% since 1986, when nesting by Caspian terns on Rice Island was first discovered (G. Dorsey, USACE, pers. comm.); annual growth in the tern colony is currently about 15 – 20%. The colony has apparently expanded at the expense of other Caspian tern colonies formerly located in Grays Harbor, Willapa Bay, and northern Puget Sound, as well as East Sand Island near the mouth of the Columbia River.

Breeding colonies of Caspian terns were not recorded for coastal Washington and Oregon until the late 1950s. During the first half of this century Caspian terns were known as a breeding species in the Pacific Northwest only from inland lakes, marshes, and impoundments (Gill and Mewaldt 1983). The first breeding record on the coast was a small colony discovered on Goose Island, Grays Harbor, Washington in 1957 (Alcorn 1958). This colony peaked in size at about 1,000 pairs in 1973, and had been abandoned by 1976 (Speich and Wahl 1989; E. Cummins, WDFW, unpubl. data). Beginning in 1974, a Caspian tern colony became established on Whitcomb Island, also in Grays Harbor, that increased in size to 1,240 pairs by 1976, but this colony was abandoned by 1981. Beginning in 1976, Sand Island, another island in Grays Harbor, was used by nesting Caspian terns. By 1981 over 2,000 pairs were nesting on Sand Island, the largest known Caspian tern colony anywhere along the Pacific Coast of North America (Gill and Mewaldt 1983). In 1984 the number of nesting pairs was estimated at over 2,775, but this colony in turn disappeared by 1993 (J. Smith, WDFW, pers. comm.). During the 1990s there has been no confirmed successful nesting by Caspian terns in Grays Harbor, although nesting attempts by small numbers of terns have been noted (M. Zahn, WDFW, unpubl. data).

In 1976 several hundred pairs of Caspian terns were discovered nesting on Gunpowder Island, near the mouth of Willapa Bay, Washington. By 1982 the Gunpowder Island tern colony had peaked at about 1,500 nesting pairs (Speich and Wahl 1989). Thereafter the Gunpowder Island colony declined, and the last confirmed nesting was by about 150 pairs in 1989 (E. Cummins, WDFW, unpubl. data).

In 1984 a colony of about 1,000 pairs of Caspian terns was noted breeding on East Sand Island in the Columbia River estuary (G. Dorsey, USACE, pers. comm.). This was apparently the first nesting record for Caspian terns anywhere in the Columbia River estuary. By 1987 the colony on East Sand Island had been abandoned, and all breeding pairs had apparently shifted to Rice Island, a large, sandy dredge disposal island 21 km further up-river. The Rice Island Caspian tern colony increased rapidly from the initial estimate of 1,000 pairs in 1986 to about 6,200 pairs in 1991 (A. Clark, USFWS, pers. comm.). The current population estimate of about 8,000 nesting pairs at the Rice Island colony is larger than the estimate of the entire Pacific Coast population of Caspian terns 15 years ago (Gill and Mewaldt 1983). The initial rapid buildup of this colony in the late 1980s and early 1990s apparently was due to shifting of breeding pairs from Sand Island in Grays Harbor, Gunpowder Island in Willapa Bay, and East Sand Island near the mouth of the Columbia River to the single large colony at Rice Island. After 1991 colony growth appeared to slow, but there was a substantial jump in the size of the Rice Island tern colony between 1995 and 1996 (Fig. 4). This increase coincided with the reported demise of a large Caspian tern colony (ca. 1,500 – 3,000 pairs) in northern Puget Sound, on the grounds of the U.S. Naval Base at Everett, WA (G. Dorsey, USACE, pers. comm.). Although details are sketchy, this colony was apparently precluded from using the former colony site in 1995 by new construction on-site. There are no subsequent reports of Caspian terns nesting in the northern Puget Sound area. This suggests that the Everett Caspian tern colony was subsumed in the Rice Island colony during the 1996 breeding season.

Other than the Rice Island colony, there were no confirmed Caspian tern breeding colonies along the coast of Washington or Oregon in 1998. Nesting was suspected, however, at a mainland site on the shores of Commencement Bay, southern Puget Sound, near Tacoma, Washington (M. Tirhi, WDFW, pers. comm.). The site is fenced off because of heavy metal contamination, and is slated for soil removal and remediation as an EPA superfund site in 1999. This site should be closely monitored to ascertain whether nesting occurs.

Some evidence from band returns supports our interpretation of the origins of the Rice Island Caspian tern colony. In 1997 and 1998, we collected a total of 10 banded adult Caspian terns on or adjacent to the Rice Island colony. All had been banded as young chicks on the Sand Island colony in Grays Harbor during the late 1970s or early 1980s. Washington Department of Fish and Wildlife banded approximately 500-1,500 Caspian tern chicks annually on Sand Island during this period (Gill and Mewaldt 1983, J. Smith, WDFW, pers. comm.). These banded adults were 17 (N = 2), 18 (N = 1), 19 (N = 3), 20 (N = 1), and 21 (N = 3) years-old at the time that they were collected on Rice Island. The number of banded adults (N = 5) in the sample of randomly collected adults for diet composition analysis (N = 304) suggests that there were several hundred banded adults on the Rice Island colony in 1997 and 1998.

In summary, the history of the Caspian tern breeding population along the Washington and Oregon coasts has been a short one (ca. 40 years) of rapid expansion, low philopatry (nest site fidelity), and large colony sizes compared with other areas of North America. This is part of a general trend for Pacific Coast Caspian terns of (1) shifting breeding colonies from inland, natural sites to coastal anthropogenic sites (dredged material disposal islands), (2) shifting from nesting in small groups within larger colonies of gulls to nesting in large, single-species colonies, (3) dramatic overall population increase, and (4) rapid northward range expansion.

Both bald eagles and glaucous-winged/western gulls have apparently played roles in the demise of former Caspian tern colonies on islands in Grays Harbor and Willapa Bay. The history of short-lived colonies and shifting breeding sites, plus observations of increasing gull and eagle disturbance at former Caspian tern colonies (J. Smith, WDFW, pers. comm.), suggests that low nest site fidelity may be related to the gradual build-up of predator populations once a colony is established. Predation by gulls and eagles is not the sole explanation, however, because some colonies have been lost primarily due to habitat degradation and loss. Caspian terns prefer to nest on bare or sparsely vegetated sand, so colony sites are frequently situated where sand accretion and erosion are persistent processes that maintain unvegetated substrate. Such sites can be washed away during winter storm tides, leaving no area above high spring tides. This was a major factor in the demise of the Gunpowder Island colony in Willapa Bay and the Whitcomb Island colony in Grays Harbor. Finally, Caspian tern colonies that become established on dredged material are usually constrained by encroaching vegetation within a few years of dredged material deposition. The demise of the East Sand Island tern colony after 1984 has been attributed to vegetation succession, combined with aerial seeding by the U.S. Army Corps of Engineers. ...

The estuary-wide population of double-crested cormorants increased in 1998 by an estimated 15% over 1997. [paragraph] This population trend is part of a continuing expansion of populations of double-crested cormorants along the Pacific coast (recently reviewed by Carter et al. 1995) and throughout North America following persecution and habitat destruction in the late 1800's and early 1900's. But the dramatic increase in the size of the East Sand Island colony over the last decade is unparalleled elsewhere in the Pacific Northwest. The East Sand Island colony was first discovered in 1987 and in 1989 there were 91 active nests (D. Bell, pers. comm. to R. Lowe, USFWS) at the site that supported about 5,250 nesting pairs during the 1998 breeding season. Thus the population of double-crested cormorants in the Columbia River estuary, like the Caspian tern population, experienced rapid growth in the early 1990s. The cormorant colony on Rice Island was first noted in 1988, soon after Caspian terns colonized the site. Again, the rapid initial build-up of these breeding colonies indicates that breeders were recruited from other colonies. Unlike Caspian terns, however, no large colonies of double-crested cormorants along the coast of Washington or Oregon declined or disappeared concurrent with increases in the Columbia River estuary (Carter et al. 1995; R. Lowe, USFWS, pers. comm.). Instead, it appears that the rapid influx of double-crested cormorants to the estuary occurred at the expense of inland colonies (e.g., Malheur NWR), where large colonies were adversely affected by prolonged draught in the late 1980's and early 1990's, which resulted in a dramatic decline in forage fish availability (G. Ivey, USFWS, pers. comm.). The double-crested cormorant colonies at East Sand Island (ca. 5,250 pairs) and Rice Island (ca. 800 pairs) are currently the two largest known colonies of this species on the Pacific Coast of North America (Carter et al. 1995). [The Rice Island colony moved to East Sand Island in 1999.] Furthermore, there have been recent dramatic increases in the number of glaucous-winged/western gulls in the Columbia River estuary. Since 1989, when 1,760 gulls were counted on East Sand Island (D. Bell, pers. comm. to R. Lowe, USFWS) the direct count of gulls on East Sand has increased by more than a factor of three by 1998. These data suggest that all populations of piscivorous colonial waterbirds have been increasing in the Columbia River estuary in the last decade."

Columbia River Estuary. The Columbia River estuary is 4 to 5 miles wide and extends upriver to around RM 38. There are two main channels, the north and south channels. The south channel is an extension of the main river channel upstream of the estuary and carries most of the river flow. This is also the main navigation channel, which is dredged annually by the Corps to maintain the presently authorized 40-foot-deep, 600-foot-wide navigation project. The north channel extends to about RM 20, near the downstream end of Rice Island. Wide, shallow intertidal and subtidal flats separate these two deep channels. Hydrology of the estuary is affected by downstream flows, which are to some extent regulated by the upriver system of dams, and ocean tides. Tidal influence extends upstream to Bonneville Dam, at RM 143. The salt wedge, however, penetrates upstream to about RM 23.

Islands in the estuary are typically intertidal in nature and most occur in Cathlamet Bay. Exceptions are East and West Sand Island in Baker Bay, Rice, Miller Sands Island and Spit and Pillar Rock (Jim Crow Sands) on the northern edge of Cathlamet Bay, and Puget and Tenasillahe Islands. Rice, Miller Sands Island and Spit, and Pillar Rock were artificially created from sandy material dredged from the Columbia River navigation channel. The Columbia River, estuary and Pacific Ocean provide habitat for a variety of aquatic flora and fauna. Plants range from phytoplankton to marsh ecosystems. Animal life ranges from zooplankton to mammals. Of significance to this Environmental Assessment (EA) are the fish species fed upon by birds for which adaptive management is proposed.

Fish. Estuarine habitats support a variety of anadromous and resident fish species. Anadromous fish are present in the river almost year-round, either as adults migrating upstream to spawn, or as juveniles, migrating downstream to the ocean or rearing in the estuary (fall chinook). Anadromous species include the following salmonids: spring, summer and fall run chinook; coho; sockeye; chum salmon; winter and summer run steelhead; and searun cutthroat trout. Other anadromous species include green and white sturgeon, Columbia River smelt, American shad and lamprey.

Resident species remain in the river and estuary throughout their life cycles. Some resident species are northern pikeminnow, common carp, small and largemouth bass, yellow perch, peamouth, large-scale sucker and white crappie.

Marine fish occur in the ocean and the estuary. Dominant marine fish in the estuary include northern anchovy, Pacific herring, Pacific sand lance, Pacific staghorn sculpin, starry flounder, longfin smelt, surf smelt, whitebait smelt, Pacific tomcod, English sole, various species of surf perches, shiner perch, rockfish species, and sanddabs.

Run size of salmon in the river has been decreasing since the turn of the century. Further declines in wild salmon numbers in the early 1990's prompted the NMFS to list or propose for listing several Columbia Basin salmonids. Estimates, provided by NMFS, of numbers of smolts reaching the estuary in 1998 and 1999 are shown below in Tables 2 and 3, respectively. The majority of the out-migrating smolts, and many of the returning adult salmonids, are hatchery fish which are produced to support important tribal, recreational and commercial fisheries, to mitigate for fish and habitat lost to the Federal Columbia River Power System (dams), and to restore threatened and endangered species. The majority of the remaining stocks of wild fish are ESA listed species. The exact proportion of wild to hatchery fish is not specifically known; however, many wild ESA stocks have been incorporated into the hatchery program.

Wildlife. There is a great diversity of wildlife in and around the estuary. These include marine mammals, furbearers, deer, numerous small mammals (including rodents), reptiles and amphibians. However, it is primarily birds that occur in the area, which could be affected by the proposed action. Three species of loons occur as spring and fall migrants and have been observed in the estuary during the winter. Grebes occur in the estuary particularly in bays, during migration and in winter. Brown pelicans typically occur from mid-spring to late fall along the

Table 2. Total and listed salmonid smolts estimated to enter the Columbia River Estuary in 1998.

Total smolts entering the estuary, by species	Number and percentage of listed smolts
Spring/summer chinook 13,082,000 	Snake River-wild 331,376 Snake River -hatchery <u>157,871</u> Total 489,247 Percent of total that is listed - 3.76%
Fall Chinook 53,220,200	Snake River -wild 24,917 Percent of total that is listed - 0.045%
Sockeye 629,000	Snake River - 57,263 Percent of total that is listed - 9.10%
Steelhead 9,228,100 (Listed -wild 1,084,118) (Unlisted -wild 418,000) (Listed-hatchery 603,888) (Unlisted hatchery 7,122,094) (16.27 % wild, 7.92% of hatchery fish are listed, 72.17 % of wild fish are listed)	Snake River - wild 615,331 Upper Columbia - wild 68,767 Upper Columbia - hatchery 603,888 Lower Columbia - wild <u>400,000</u> Total 1,687,986 Percent of total that is listed - 18.29%
Coho 19,448,400	None are listed
Chum 1,000,000	None are listed
Total Smolts 96,609,700	Total Listed 2,259,413 Percentage of total that are listed - 2.34%

coast, with concentrations of up to 1,000 birds at the mouth of the Columbia at South Jetty and East Sand Island-Baker Bay (Briggs et al. 1992 IN Corps 1998).

Double-crested, pelagic and Brandt's cormorants occur in the estuary and forage in estuary waters. Cormorants tend to perch on the numerous pile dikes in the estuary. Double-crested cormorants are the most numerous and occur year-round. East Sand Island supports a large nesting colony of double-crested cormorants. Rice Island also supported a large colony of cormorants; however, this colony apparently moved to East Sand Island in 1999. Nine gull species commonly occur off the Oregon coast, and three others are known to occur. Gull colonies are located on East Sand Island, Rice Island and Miller Sands Spit and consist of glaucous-winged/western gull hybrids. Ring-billed gulls also nest on the Spit. Three species of tern occur in the river or nearshore areas. Common and Arctic terns occur off the coast from April to September, principally as migrants. Caspian terns are present from April to September and occupy a large breeding colony on 2.4 acres (previously 8 acres) of the western end of Rice Island. The Caspian tern nesting population has grown from about 1,000 pairs in 1984 (on East Sand Island) to an estimated 8,100 pairs on Rice Island and 1,400 pairs on East Sand Island in 1999. Much of this increase appears to have occurred from colonies at other locations shifting to the Columbia River estuary, apparently due to habitat loss elsewhere. This colony currently represents the largest known Caspian tern colony in North America and perhaps the largest in the world. Relocation of nesting colonies has been a repeatedly observed behavior of Caspian terns along the Pacific Coast of North America.

Table 3. Listed and total salmonid smolts estimated to enter the Columbia River estuary in 1999.¹

Listed smolts entering the Estuary	Total Smolts entering the Estuary ²
Spring/summer chinook yearling smolts-listed Upper Columbia-wild 133,934 Upper Columbia-hatchery 380,470 Snake River-wild 754,957 Snake River-hatchery 325,738 Lower Columbia-wild 350,000 ³ Upper Willamette-wild <u>600,000⁴</u> Total spr/sum ck 2,545,369	Spring/summer chinook yearling smolts-total 22.4 to 27.0 million 9 to 11 percent are listed
Fall chinook sub-yearling smolts- listed Snake River-wild 88,704 ⁵	Fall chinook sub-yearling smolts- total 18.2 to 22.4 million 0.4 percent listed
Sockeye salmon smolts -listed Snake River - wild 3,025 Snake River- hatchery <u>15,000</u> Total sockeye 18,025	Sockeye Salmon Smolts-total 500,000 to 1.0 million 1.8 to 3.6 percent listed
Steelhead smolts-listed Snake River basin-wild 715,000 Upper Columbia-wild 61,791 Upper Columbia-hatchery 634,985 Mid-Columbia-wild 208,000 Upper Willamette-wild 210,000 ⁶ Lower Columbia-wild <u>400,000⁷</u> Total steelhead 2,229,776	Steelhead Smolts-total 10.0 to 14.4 million 15.3 to 22.8 percent listed
Chum Salmon smolts-listed Columbia River-wild 1,000,000 ⁸	Chum Salmon Smolts-total 100 percent listed
Coho Salmon Smolts-listed None listed	Coho Salmon Smolts-total 16.0 to 20.0 million None listed
Total listed smolts 5,881,874	Total smolts 68.2 to 85.8 million 6.9 to 8.6 percent listed

¹ Unless otherwise noted, smolt number estimates are from Schiewe, 1999.

² The spread in smolts estimates is based on the scenarios in Schiewe 1999. Generally the upper range represents the full-transportation scenario and the lower range represents the no-transportation scenario.

³ Back-calculated from 3,500 Sandy, Clackamas and other Lower Columbia ESU wild spring chinook adults at 0.01 smolt-to-adult survival. Does not include 1.0 million Cowlitz Hatchery spring chinook deemed “essential for recovery”.

⁴ Back-calculated from 6,000 Upper Willamette wild spring chinook adults at 0.01 smolt-to-adult survival.

⁵ Does not include 900,000 in-ESU smolts released to supplement natural spawning.

⁶ Back-calculated from 4,200 Upper Willamette wild steelhead adults at 0.02 smolt-to-adult survival.

⁷ Back-calculated from 8,000 Lower Columbia wild steelhead adults at 0.02 smolt-to-adult survival.

⁸ Back-calculated from 2,000 Columbia River chum salmon adults at 0.005 smolt-to-adult survival.

Waterfowl are seasonally abundant. Agricultural lands along the river and intertidal marshes in the estuary provide substantial habitat along the lower river. Mallards, northern pintails, American wigeon, green-winged teal, Canada geese, and scaup are the most abundant wintering species. Mallards and Canada geese are the principal nesting species. Islands, particularly dredged material

islands, are important nesting sites for the resident populations of Canada geese and mallards. Substantial numbers of wintering Canada geese use these islands.

Raptors (hawks, owls) occur both as residents and/or wintering birds. Bald eagles are relatively abundant. Peregrine falcons are also present, as are several species of hawks and owls.

Many other nongame bird species occur throughout the estuary. Shorebirds are abundant during spring and fall migration with substantial numbers over-wintering in the estuary. Large concentrations of shorebirds use high tide roosts at the downstream tips of Rice Island and Miller Sands Spit. While riparian habitat is important to many of these nongame bird species, some prefer grassy uplands and dredged material disposal sites. Savannah and white-crowned sparrows and horned larks inhabit dredged disposal sites where the open, sparsely vegetated terrain provides preferred nesting and foraging habitat.

Human Population. Except for the Cities of Astoria, Warrenton, Hammond, Chinook and Ilwaco, human population along the estuary is sparse. Astoria is the largest population center and sustains the only deep draft port below RM 68. Clatsop County, Oregon, and Wahkiakum and Pacific County, Washington, all have relatively small populations and resource based manufacturing sectors. Forest and farmlands dominate the estuary and lower river. Fishing, and fish related industry, still have local interest and is the primary economic base of some smaller communities such as Ilwaco and Chinook, Washington, and Warrenton, Oregon. One organization, Sea Resources in Chinook, Washington, maintains a salmon hatchery at RM 4 of the Chinook River. Sea Resources is a community non-profit organization that is presently involved in watershed restoration. The hatchery is a tool to restore fish runs as part of a healthy watershed. About a million chinook, chum and coho are raised and released from the hatchery.

There are several terminal fishery rearing pens in the estuary. These are in Young's Bay, at several tributaries to the Columbia River, Tongue Point (Oregon), and Grays Bay/Deep River (Washington). Salmon are released as juveniles and then the adults are harvested near the release spot. The Youngs Bay terminal fisheries were established as part of a Clatsop County Economic Development Council program. These and other estuary terminal fishery efforts have ODFW and BPA involvement.

East Sand Island. East Sand Island, located near RM 5 of the Columbia River, was withdrawn from the public domain for military use in 1863, was utilized as a military observation post during World War II, and reassigned to the Corps in 1954. Over the years, accretion (some from dredged material disposal) and erosion have changed the size and shape of the island and caused it to shift in location north of its original position. Presently, the island mass is separated by a channel into West Sand Island and East Sand Island. The entire island mass remains within the State of Oregon, the State boundary following the channel separating the islands from Chinook and Ilwaco, Washington. (The islands remain in Oregon because of their origins on the south side of the historic Columbia River channel.) West Sand Island is occasionally used as a disposal area for maintenance dredging of material from Baker Bay West Channel. Chinook Channel material, containing silts, has gone to East Sand Island, most recently in 1983. Pile dikes were built along the island beaches to control erosion and control the river at both islands. During the 1970's, West Sand Island was leased for cattle grazing, but this activity has not occurred since 1975. The only access to the islands is by boat. Minimal recreational activity occurs on these islands,

principally camping, beach combing and waterfowl hunting. The islands are not managed for any activity other than dredged material disposal.

East Sand Island is presently about 6,000 feet long by 100 to 500 feet wide and contains about 53 acres of grass-covered sandy and silty soil. Dredged material has been disposed on the eastern end and southern side several times, the most recent in 1983. The disposal location, a diked upland site, has developed wetlands on a portion of the area. Tidal marsh flats are present along the bay side of the island. The eastern end of the island is covered with herbaceous vegetation, primarily European beach grass and some American dune grass. Coast willow and red alder are also present. Woody debris left by high river flows and tides occurs at the high tide line. Central and western portions of the East Sand Island have remnants of WW II era railroad and concrete “pill boxes.” Any remaining cultural resources on the east end have been covered by dredge spoils.

Approximately 7,000 pairs of glaucous-winged/western gulls nest throughout East Sand Island. Approximately 300 pairs nested in the area at East Sand Island managed for tern nesting habitat prior to habitat management efforts in 1999. Double-crested cormorants nest in a large colony on the downstream one-half of the island. This colony, estimated to be over 6,000 pairs in 1999, is the largest breeding colony of double-crested cormorants on the west coast of North America. There is also a small colony of 30 to 40 pairs of Brandt’s cormorants nesting on the pile dike at the western end of East Sand Island. The western half of East Sand Island constitutes the second largest brown pelican roost site in the Pacific Northwest. USFWS recorded 1,200 pelicans here in 1998. Canada geese and mallard ducks nest to a limited extent in the project area. Nesting by Caspian terns in the Columbia River estuary was first observed in 1984 when approximately 1,100 pairs nested at East Sand Island. The 1984 colony location was within the diked disposal area used in 1983 for dredged material placement, approximately 350 feet northwest of the pipeline outfall location. The colony location in 1985 was still within the diked disposal area, north of the 1984 location and west of the outfall location. The 1986 colony location at East Sand Island was outside the diked disposal area, in a low-lying area just above the beach and amongst the driftwood. Approximately 1,000 terns were reported nesting on Rice Island in 1986 and the entire colony has located at Rice Island thereafter. Revegetation by local species within the diked disposal area apparently led to shifts in the colony location at East Sand Island and ultimately to the colony’s shift to Rice Island.

Preferred nesting habitat in Washington State apparently also was reduced in the 1980s’ and 1990’s and contributed to the shift in tern nesting location and the increase in size of the tern colony in the Columbia River estuary.

About 8 acres of East Sand Island were scarified in 1999 to provide nesting area for Caspian terns. Up to 1,400 pairs of terns did nest at the site, using about 0.7 acre of bare sand habitat. Revegetation was rapid, however, and the entire cleared area is again largely vegetated. The island’s cormorant colony also increased in size in 1999. It is assumed these birds moved from Rice Island due to tern harassment, which also disturbed the cormorants.

Rice Island. Rice Island, located at RM 21-22 of the Columbia River north of the main navigation channel, is one of a series of dredged material disposal islands created by the Corps upstream of Astoria. Continued use of Rice Island, as a disposal site, is a significant component in maintaining the navigation channel. Management of dredged material disposal at Rice Island and other nearby disposal sites includes revegetation to reduce wind erosion, provide wildlife habitat, and

discourage tern nesting. Rice Island is just north and west of Miller Sands Island and Miller Sands Spit, also dredged material disposal islands. Rice Island is about 8,000 feet long by 1,800 feet wide and covers about 230 acres. It consists of sandy material dredged from the Columbia River navigation channel. Dredged material is placed on some portion of the island nearly every year. Grasses have been planted periodically in the past to reduce blowing sand. Planting has been generally unsuccessful at Rice Island, due to wind erosion of sand around seedling roots. The USFWS, Lewis and Clark National Wildlife Refuge, formerly managed Rice Island, until 1994, under a management option with Oregon Division of State Lands (DSL). The USFWS has not renewed its option to manage Rice Island.

The island has remained uncolonized by animals other than voles and birds, principally double-crested cormorants, Caspian terns, glaucous-winged/western gull hybrids, Canada geese, and horned larks and other passerines (perching songbirds) that prefer sparsely vegetated habitat. In 1986, a portion of the Caspian tern colony from East Sand Island, about 1,000 pairs, began nesting at Rice Island. Based on research, including aerial photography, there were about 8,000 pairs of Caspian terns nesting on Rice island in 1998 and 1999.

Caspian terns first arrive on the colony in late March to early April. Egg laying takes place throughout May, with the peak of laying during the second week of May. However, egg laying has been recorded as early as the third week of April at Grays Harbor, Washington. Most young have fledged by mid-July. Caspian terns nesting on Rice Island fed entirely on fish, and mostly juvenile salmonids, during the 1997, 1998 and 1999 breeding seasons.

Roby et al. (1998) and Collis et al.(1999) reported that the diet composition (based on bill load observation and fish dropped) of terns contained the highest percentage of salmonids (73 percent of identifiable prey items in 1998) of those fish-eating birds that were studied in the estuary. For comparison (based on chick regurgitations and adult stomach contents), the salmonid diet composition for all double-crested cormorants sampled was 53 percent and 15 percent of identifiable prey items for those nesting on Rice Island and East Sand Island, respectively. The proportion of juvenile salmonids in the diet for gull hybrids was 13 percent and 6 percent of identifiable prey biomass for those nesting at Rice Island and East Sand Island, respectively (Collis et al. 1999).

For terns in 1998, chinook smolts were the most prevalent species of identifiable salmonid prey types (49 percent), followed by coho (35 percent) and steelhead (16 percent). Early in the 1998 breeding season, the diet was comprised mostly of chinook salmon and steelhead smolts, by coho smolts in the middle of the breeding season, and by chinook salmon and other species later in the season. The proportion of salmonids in the diet declined as the breeding season progressed, and by July, salmonids no longer composed the majority of prey consumed. Estimates of consumption of juvenile salmonids by terns were based on fish identified in bill loads throughout the 1998 nesting season (sample size = 1,137 fish). Foraging distribution of Caspian terns from the Rice Island colony location was investigated in 1998 by OSU-CRITFC researchers through the use of aerial surveys. They determined (Collis et al. 1999) that 25 percent of foraging terns were within 2.6 miles of Rice; 50 percent within 4.6 miles or to just downstream of Tongue Point; 75 percent were within 9.2 miles, between rivermile 11 and 30; and 90 percent within 13 miles. The 90 percent ring encompasses East Sand Island at the downstream end to just upstream of Skamokawa. The aerial survey technique used to describe spatial use of the estuary by Caspian

terns could not distinguish between commuting and foraging birds, so results are biased, perhaps underestimating foraging range by as much as 30 percent (Ostrand et al., 1998).

Double-crested cormorants established a nesting colony on Rice Island, arriving in 1988. There were about 1,200 nesting pairs on Rice Island in 1995 (Carter et al. 1995 IN ODFW 1998). This is the second largest colony on the west coast of North America north of Mexico. Cormorants arrive on the colony in early April and lay eggs from early May to mid-June. Fledging extends through the beginning of August. There were no cormorant nests on Rice Island in 1999. Hazing of Caspian terns also disturbed the cormorants and they apparently moved to East Sand Island.

Miller Sands Spit and Pillar Rock. Miller Sands consists of two dredged material disposal sites, Miller Sands Island and Miller Sands Spit. These sites lie within the USFWS', Lewis and Clark National Wildlife Refuge. Miller Sands Island was created in the 1930's and has not been disposed on since that time. The Spit is a 2.5-mile-long curving finger of sand just south of the navigation channel, and about .5 mile north of Miller Sands Island, except where the Spit curves toward the island. It was created in 1975, is actively utilized as a disposal site, and continued use of the site for disposal is important to maintenance of the navigation channel.

Western/glaucous-winged gull hybrids and ring-billed gulls nest on the western tip of the Spit. Canada geese also nest on the Spit, as well as on nearby Miller Sands Island. There is a harbor seal haulout south of the islands. Western grebe, mallard, many other duck species, shorebirds and various species of gulls are abundant in the vicinity, particularly the embayment between the spit and the island. Nutria are abundant at Miller Sands Island and a few muskrat also inhabit this island. A pair of bald eagles nest on Miller Sands Island; the Spit is part of their home range and foraging territory. The Spit has periodically been planted with grasses following placement of dredged material. Vegetation attempts have been moderately successful on the Spit. Miller Sands Island also has Scot's broom, willow and alder habitat. The Spit was the site of an attempt to relocate some of the Caspian tern colony in 1998. A few pairs tried to nest here, lured by decoys and calls: predatory gulls and crows made nesting unsuccessful.

Pillar Rock is a dredged-material formed island upstream of Miller Sands at RM 28. The island is actively utilized as a disposal site, and continued use of the site for disposal is important to maintenance of the navigation channel. Most of the island is currently vegetated. No colonial nesting birds occur at Pillar Rock Island. Aggregations of Caspian terns do gather on the upstream beaches to loaf. Waterfowl, shorebirds, various gulls and herons make substantial use of the marsh-mudflat habitat associated with the island. Canada geese nest on the island in relatively substantial numbers, and there is considerable use by bald eagles.

Washington Coast: Grays Harbor. Historically, there were several Caspian tern nesting sites along the Washington coast. Colonies existed in Willapa Bay, Grays Harbor and Puget Sound. Storms that eroded habitat and development that destroyed nesting areas are probable contributors to the loss of habitat in recent years. Increases in predation by gulls and eagles that typically follow tern colony establishment apparently also contributed to colony abandonment in Grays Harbor.

The Grays Harbor estuary is located about 100 miles southwest of Seattle (see Figures 2 and 3). The 22-mile Grays Harbor navigation channel is dredged where necessary on an annual basis to maintain a shipping channel through an estuary from the Pacific Ocean to the head of navigation at Cosmopolis, Washington. Without annual maintenance dredging, shoaling would lead to a

shallower channel that would reduce the ability of large ships to enter and leave safely. The local economy in the area is historically tied to forest products, which are typically shipped to domestic and international markets.

Construction of the jetties at the harbor entrance in the early 1900s, and dredging and disposal of dredged material from the navigation channel, probably has affected sedimentation in Grays Harbor, leading to creation and dissolution of islands. Winter storms also leads to erosion of the islands. For example, Goose Island, in North Bay, accreted sometime after 1913, provided nesting habitat for geese and terns through the 1980s. By the late 1990s, it had eroded and is no longer above the water level of the bay. Sand Island, south and east of Goose Island, also came into existence after 1913. Although it has eroded, it is still has surface level above ordinary high high water (OHHW) and is available as habitat. Other islands, such as No Name Island and an unnamed island, have recently accreted south and east of Sand Island. Cate Shoal has accreted in South Bay, off the mouth of John's River. (Peters et al. 1978; E.Cummins, WDFW, personal communication 1999). Goose Island was given "Natural Area Preserve" status in 1973, initially to protect Caspian terns that nested there. This and other newly accreted islands are owned by the State of Washington and managed by the Department of Natural Resources (DNR). The general zone around Goose and Sand Islands, part of the DNR's Scientific Preserves, is categorized as "Natural" environmental type under the Grays Harbor Estuary Management Plan. Whitcomb Flats, also in South Bay but further west, is categorized as "Conservancy Natural". The area has eroded and was below water in early 2000 (Jack Smith, WDFW, pers. comm.)

Caspian terns were first documented as nesting in Grays Harbor in the 1950s. Terns were first reported on Goose Island in 1957; an estimated 70 nesting pairs used the site in 1958. About 1,000 pairs were estimated in 1973. By 1975, only 90 nests were reported. Much of the habitat had eroded. On Sand Island, about 1,700 nesting pairs of Caspian terns were reported in 1977. Caspian terns were reported to nest on Whitcomb Island in the early 1970s. In August 1974, a 2,000-3,000 bird colony, still incubating eggs, was estimated to occur on the island. By 1977, only 307 nests were observed. Declines in nesting were followed by increases on other islands and locations, such as Willapa Bay, between Grays Harbor and the Columbia River Estuary (above text summarized from Peters et al. 1978, with internal citations; see also text under Affected Environment above.). Caspian tern nesting increased again during the 1980s, reaching a reported 3,590 nests on Sand Island in 1987. Subsequently nesting declined, with no nests reported on Sand Island after 1989, and only 34 Caspian tern nests on Whitcomb Flats in 1996 (WDFW 1997). Gulls, including western and glaucous-winged and ring-billed gulls, also nested [and continue to nest] on these islands. Gulls tend to nest on more heavily vegetated portions of the islands, while terns nested on sparsely vegetated areas down to the high-tide line. Vegetation reported in the 1970's included American dune grass, European beachgrass, American searocket, sea purselane, creeping bentgrass, common velvet grass, Baltic rush, Lyngby's sedge, shore orache and various other herbs (Peters et al. 1978). Newly accreted islands tend to be colonized by non-native species, such as European beachgrass (Cummins, pers. comm. 1999).

Cate Island appears to be fairly recent in origin, probably emerging in the last decade. It is located on the south side of Grays Harbor, about half a mile north of the mouth of the Johns River, and about a quarter of a mile offshore. It is about 4 miles east of Westport and about 7 miles from the mouth of Grays Harbor. It is not to be confused with Markham Island, a low-lying, marshy island closer to the mouth of the John's River that is managed by WDFW as a Wildlife Area (Roby, pers. comm. 2000).

Cate Island is long, narrow, and low-lying. It is about 4 acres above mean high tide, with most of the island between 5 and 10 feet above high tide. The island is about 1,800 feet long and 150-200 feet wide, with the long axis running east-west. It is mostly vegetated with European beach grass and has few large snags and other large woody debris; thus there are few suitable perches for bald eagles. Cate Island appears to be entirely natural in origin. The substrate is sandy, but not as coarse and silt-free as Rice Island. Little is known about the history of use by nesting birds of Cate Island. No gulls successfully nested there last year. Nearly 200 Caspian terns were seen roosting at the east end of Cate Island in late July 1999; however, there is no evidence that terns have ever nested on Cate Island. There is some use by bald eagles (Ibid.).

There are about 50 species of resident, anadromous and marine fishes present in Grays Harbor during various stages of their life cycles (Wash. Dept. of Ecology 1977). Six species of salmonids utilized the harbor: chum, coho, chinook, Dolly Varden/bull trout, steelhead, and cutthroat trout. Smelt and American shad were also important anadromous species (Ibid.). Chum populations are native and healthy, though abundance fluctuates (WDFW 1993). Spring chinook populations are relatively stable, with a general increase since the mid-1970s to 1997. Fall chinook populations are also stable to increasing (1976-1997) and coho populations have fluctuated, though are generally stable (Pacific Fishery Management Council 1999). There is a tribal fishery.

Resident fish include various flatfish and sand lance. Juvenile English sole and other flatfish species were found in surveys throughout Grays Harbor in the 1980s in the shallow sub-littoral zone (Corps NWS 1999). The most active coastal forage fish fishery is for anchovies, providing bait for salmon and sturgeon fisheries. Anchovy spawning peaks from February through April (WDFW 1997).

Fish common to the area on which Caspian tern have foraged previously include shiner perch, chum salmon, Pacific staghorn sculpin, white seaperch, whitebait smelt, snake pricklyback, cutthroat trout and longnose dace (WDOE 1977). Dungeness crab and razor clams occur in the estuary. Oyster beds are found around several of the islands, including Cate Island. Amphipods, such as *Corophium*, and polychaete worms are also present.

There is a great variety of bird life in Grays Harbor. About 325 species from 56 families of birds were reported for Grays Harbor. These included fish-eating waterbirds, shorebirds, waterfowl, gulls and terns, and terrestrial birds (WDOE 1977).

Native American Concerns. Indian Tribes that may have concerns about Federal water resource projects in Grays Harbor include the Quinault Indian Nation, Chehalis Indian Tribe, and the Shoalwater Bay Tribe. Concerns of greatest importance include treaty rights, specifically the right to fish in the Grays Harbor area, removal of plant material used in making traditional crafts, preservation of sites important in the practice of Native American religion, and preservation of fisheries habitat. The Quinault Indian Nation has a reservation established by treaty, and is the only tribal entity to have legally guaranteed usual and accustomed fishing grounds in Grays Harbor.

Threatened and Endangered Species. The US Fish and Wildlife Service (USFWS) has identified several threatened and endangered species as occurring in or near the Columbia Estuary. These are brown pelican, bald eagle, western snowy plover and Oregon silverspot butterfly; and one

plant species, *Howellia*. Brown pelicans occur at and around East Sand Island and are generally present from June to October. Wintering and resident bald eagles are known to forage along the Columbia River, and resident pairs occur in the project vicinity. One pair nests on Miller Sands Island, and previously attempted to nest on Rice Island. Another pair nests on the Washington mainland near East Sand Island. Western snowy plovers formerly occurred on Oregon beaches just south of the Columbia River and a small population is present at Leadbetter Point, Willapa Bay, Washington. Oregon silverspot butterfly requires very specific habitat and is not known to occur in the project area, nor does *Howellia*.

The NMFS has listed the Snake River spring, summer and fall run chinook salmon as threatened and Snake River sockeye as endangered; Lower Columbia River steelhead, Snake River steelhead, Columbia River chum salmon; Lower Columbia River, and Upper Willamette River chinook; and Middle Columbia River steelhead and Upper Willamette River steelhead as threatened; and the Upper Columbia River steelhead and Upper Columbia River chinook as endangered. The coastal cutthroat trout is proposed for listing as threatened.

State-listed or sensitive species (for Oregon) known to occur in the project vicinity include brown pelicans and bald eagles, which are also on the Federal list, peregrine falcon and Lower Columbia River coho. Horned larks nest on Rice Island; it has not been established if these are streaked horned lark, an Oregon Natural Heritage Program species of concern in the Willamette Valley. This species' State status is "critical" in the Willamette Valley and Klamath Mountains.

Federal or State listed species potentially found in Grays Harbor County include: bald eagle, peregrine falcon, brown pelican, marbled murrelet, Western snowy plover, green sea turtle, leatherback sea turtle, loggerhead sea turtle, olive ridley sea turtle, Oregon silverspot butterfly, and marsh sandwort. In addition, Newcomb's littorine snail is a candidate species. Coastal-Puget Sound bull trout were listed as threatened effective December 1, 1999. The coastal cutthroat trout is proposed for listing as threatened, and the coho is a candidate for listing.

ENVIRONMENTAL EFFECTS

Impacts to Columbia River Estuary. Relocation of the Caspian tern colony from Rice to East Sand Island would affect the fish species that the terns would eat. More species and total numbers of fish are present in the lower estuary. Fish expected to replace salmonids in the tern's diet include American shad, northern anchovy, Pacific herring, Pacific sand lance, Pacific staghorn sculpin, starry flounder, longfin smelt, surf smelt, whitebait smelt, Pacific tomcod, English sole, various species of surf perches and shiner perch. These species are cosmopolitan in nature and serve as the prey source for most fish species in the ocean. As such, they are in high abundance and losses due to predation by the terns would not affect these populations. Results from 1999 field work on Caspian tern dietary composition indicates that terns nesting on East Sand Island ate fewer salmonids (44 percent of fish delivered) than terns at Rice Island (75 percent of fish delivered). These results are consistent with the hypothesis that a more diverse array of prey is available to terns lower in the Columbia River estuary.

Impacts to the Sea Resources' hatchery are not expected to be significant. While most Sea Resources hatchery releases into the Chinook River occur outside of the tern breeding season, some increase in consumption of chinook smolt would occur. Other fish species are available for terns to feed on. As agreed on in the previous EA, NMFS and WDFW have met with Sea

Resources to improve their hatchery efforts, although funding remains an issue. The Corps has initiated a Section 1135 habitat restoration study on the Chinook River. Preliminary indications are that by removing tide gates, about 900 acres of tidal lands along the Chinook River could be restored.

The terminal fisheries at Tongue Point and Grays Bay are not expected to be negatively affected. These locations are closer to Rice Island than East Sand Island and tern predation rates on smolts from these two sites may be reduced. Releases from the net pens at Youngs Bay may be exposed to greater tern predation; however, given the availability of other fish species, this is not expected to be significant. If terns reestablish nesting sites in Grays Harbor, feeding on Columbia River estuary hatchery fish would decline, though there would be some increase in feeding on fish (shiner perch, chum salmon smolts) in Grays Harbor.

Impacts to Caspian terns may include successful nesting of a smaller colony within the estuary, or crowding and reduced productivity until colonies re-establish. Provision of 4 acres of nesting habitat at Grays Harbor would result in no net loss of habitat for the Columbia River estuary colony for 2000. See specific impacts by activity site, below.

Impacts to East Sand Island. Mechanical equipment and/or herbicides would be used to till approximately 4 acres of first-year successional grass-forb habitat. Any small mammals (rodents, such as voles) re-occupying this habitat would probably be lost unless they could move into adjacent habitat (which is generally assumed to be at capacity). This activity would occur in winter or early spring after colonial and other nesting birds would have completed nesting activities and brown pelicans have migrated. There could be some minor, short-term turbidity as the equipment is loaded off/on a barge. Based on experience during the 1999 season, recorded Caspian tern calls as part of the relocation attempt are not audible to humans on the mainland. The closest residences, at Chinook, Washington, are about 1 mile distant.

Assuming the maintenance of a breeding colony site is successful, large numbers of Caspian terns would begin nesting in this area in April 2000. It is assumed that similar foraging behavior would occur around an East Sand Island colony in 2000 as was observed around the Rice Island colony in 1998-99. Tern foraging would not be precluded from the area of Rice Island by shifting the colony to East Sand Island, but the majority of their foraging activity would be expected to occur downstream of Tongue Point, with Caspian terns also foraging in offshore waters. While some birds currently forage near East Sand Island from the Rice Island colony, it is assumed there would be a substantial increase in foraging bird numbers around East Sand Island when the colony shifts there. Tern diet composition is expected to shift, and consist of a higher percentage of marine fishes such as herring, anchovy, smelt, sand lance and perch, with relocation to East Sand Island. Research results from the 1999 pilot project indicate that Caspian terns that did relocate to East Sand Island consumed 41 percent fewer salmonids than did the terns nesting on Rice Island. However, terns continued to consume many salmonids.

Initially, gulls that exhibit predatory behavior toward the nesting Caspian terns would be removed. If necessary, this would be by lethal means. Up to 200 gulls may have to be killed to protect tern nesting efforts early in the season. This loss constitutes less than 1.5 percent of the gulls (7,000 pairs) presently nesting on East Sand Island. Given the many thousands of gulls in the estuary, this is not expected to be a significant loss. Gulls and Canada geese that formerly nested at the project site are expected to nest elsewhere on the island. No significant impacts to the gull population or

the use of East Sand Island as an index site for Canada goose management are foreseen. The cormorant colony is located on the downstream half of the island and is not expected to be affected by activities on the upstream end. In-season management actions would be coordinated with the CTWG to avoid disturbance of cormorants. Brown pelicans also occur on the downstream end of the island. Protective measures requested by USFWS would be implemented to avoid impacts to pelicans. These include signage to preclude human access.

If terns are attracted to other sites provided in Grays Harbor, natural predation by gulls may not be interfered with, in order to encourage terns on East Sand Island to disperse. In-season management decisions would be made in consultation with the CTWG.

Impacts to Rice Island. If the relocation is successful, there would be no Caspian terns nesting on Rice Island. Preventing terns from nesting on Rice Island will probably require harassment after egg laying begins and could involve taking of eggs. For purposes of this environmental assessment, it is assumed that the level of egg take is up to approximately 300 eggs. The impact of such an action is, if done early in the breeding season, for the birds to re-lay later and nest somewhere else later. Eggs taken later in the breeding season may result in no production from that pair of birds. If human disturbance of terns is necessary, other birds, especially cormorants and gulls, attempting to nest in that area would also be disturbed. In-season management of disturbance activities implemented in coordination with the CTWG is expected to avoid significant impacts to other wildlife species at Rice Island. A few Canada goose nests may be lost due to measures implemented at the tern colony location. These losses are not expected to compromise use of Rice Island as an index site for Canada goose management. The cormorant colony did not nest here in 1999 and is not expected to return to Rice Island due to harassment activities. The cormorants have apparently relocated to East Sand Island. Relocation of the tern colony would reduce available prey for bald eagles in the vicinity of the island. However, relocation is typical of tern colonies and predator species have had to adjust when this occurred. Further, prey resources for bald eagles in the Columbia River estuary are not considered limiting to the population.

If relocation is unsuccessful and terns do not nest successfully on East Sand Island due to vegetation encroachment, disturbance by gulls, crowding, or other factors, they may remain in the estuary, consuming juvenile salmonids but not reproducing for the 2000 nesting season. Low nesting success for one or two seasons is not expected to significantly impact the number of birds comprising the colony. Nesting success was low in 1997, when only about 400 young were successfully raised. An estimated 4,000 terns were fledged from the Rice Island colony in 1998 and again in 1999. Information on young fledged in 1999 indicates that about 4,000 young fledged at Rice Island, and 1,700 fledged at East Sand Island. The successful fledging at East Sand Island reflects less crowded conditions and removal of predatory gulls. Birds with long life spans, like the tern, can withstand short-term losses of young, since the adults will produce young in future years. Monitoring and evaluation during the proposed action will document nesting success during the dispersal attempt. Provision of alternate nesting habitat at East Sand Island and Grays Harbor, coupled with attraction measures and field research to be conducted on tern nesting and foraging ecology, represent measures taken to ensure colony retention and nest success. Information obtained will be used to fine-tune future dispersal efforts.

Impacts to Miller Sands Spit and Pillar Rock. Human disturbance at the Spit may also discourage gulls from nesting and could cause abandonment of some Canada goose and early mallard nests.

Terns congregate on bare sand, whereas geese and duck nest in vegetative cover. The proposed disturbance efforts are short-term events (minutes in length). Brief disturbance events in bare, sandy habitat would have minimal impact on nesting geese and ducks. The use of Miller Sands Spit as an index site for goose management should not be compromised by proposed activities.

Impacts to Grays Harbor. Successful reintroduction of Caspian terns on selected islands in Grays Harbor would reduce tern consumption of Columbia River salmonids, and increase consumption of fish species in the Grays Harbor area. Tern reproduction at a restored colony site in Grays Harbor would probably be successful due to the previous history of tern nesting in Grays Harbor, the presence of colony monitors on the restored site, and control of gull predation on tern eggs and chicks. In the future, natural predation by gulls and eagles is expected to maintain the reintroduced colony at previous levels (4,000 pairs or less) will be allowed.

The shifting of a nesting population, upwards of 4,000 pairs, of Caspian terns to Grays Harbor, Washington, would result in predation upon marine, estuarine and some freshwater fishes. The presence of nesting Caspian terns, and their predation on local fish resources, does not represent a new phenomenon for Grays Harbor. Caspian terns were first reported nesting in Grays Harbor in 1957 (Alcorn 1958; cited in Peters et al. 1978). A thousand pairs were present on Goose Island in 1973 and a population of 1,737 pairs occurred on Sand Island in 1977 (Peters et al. 1978). WDFW unpublished data record 3,590 Caspian tern nests on Sand Island in 1987 (Table 4). The subsequent shifting of the nesting population to the Columbia River estuary is estimated to have substantially reduced predation levels by Caspian terns on fish resources present in Grays Harbor. Migrants and non-breeders would have continued to forage in the estuary after the tern colony vacated Grays Harbor.

Some of the fish species present in Grays Harbor and/or previously documented as prey for Caspian terns in the estuary include shiner perch, white seaperch, whitebait smelt, Pacific staghorn sculpin, snake prickleback, longnose dace, coastal cutthroat trout, chum salmon, chinook salmon (spring and fall run), coho salmon, and steelhead. Herring, sand lance and surf smelt populations are abundant at Grays Harbor or immediately offshore. Collis et al. (1999) recorded shad, herring, sardines, peamouth, northern pikeminnow, smelt, suckers, Pacific lamprey, shiner perch, yellow perch and bass (*Micropterus* spp.) in the diet of Caspian terns foraging in the Columbia River estuary. Collis (pers. comm., 2000) identified salmonids as comprising 46 percent of the diet composition of Caspian terns nesting on East Sand Island in 1999. Northern anchovy (17 percent), surfperch (10 percent), herring (8 percent), unidentified non-salmonids (6 percent), smelt (4 percent) and sculpin (4 percent) comprised the majority of the other species in the diet of East Sand Island Caspian terns in 1999 (Collis, pers. comm., 2000). These species, to the extent they are present, would also be expected to occur in the diet of Caspian terns present in Grays Harbor.

It is estimated that prey species composition for Caspian terns that reestablish in Grays Harbor would be dominated more by marine/estuarine fish species than that which was observed at East Sand Island in 1999. Islands considered for Caspian terns in Grays Harbor lie roughly the same distance (6 miles) from the ocean as East Sand Island does in the Columbia River estuary. Grays Harbor is also a smaller estuary and a more saline environment than the freshwater dominated Columbia River estuary, particularly during the juvenile salmonid outmigration period. Thus, it is probable that marine/estuarine fish will be more abundant in the estuary as compared to the Columbia River estuary. Consequently, Caspian terns may forage more intensively on marine and

estuarine fish species than juvenile salmonids in Grays Harbor compared to terns present at East Sand Island in the Columbia River estuary.

The rationale behind moving Caspian terns from the Columbia River estuary has been to reduce predation on ESA stocks of juvenile salmonids. Artificial habitat conditions (dredged material islands), coupled with an abundant prey base (juvenile salmonids) and loss of previous tern habitat in the western U.S., attracted nesting Caspian terns to the Columbia River estuary. The presence of Caspian terns in Grays Harbor would result in predation on chum, chinook (fall and spring), coho, steelhead, and coastal cutthroat salmonid stocks, principally originating from the Chehalis and Humptulips Rivers. Concern has been raised that Caspian tern predation will adversely impact these stocks. A review of Grays Harbor Caspian tern numbers compared to terminal run size numbers for salmonids (Table 4) provides some interesting comparisons. The high point for chum salmon returns (1988) occurred during the period of highest Caspian tern numbers in Grays Harbor. Conversely, the lowest run return for chum salmon occurred in 1990; juvenile outmigrants for that adult return would have entered the estuary during a peak population period for Caspian terns. Spring chinook numbers in 1988 were well above the average run size for the period 1981-1997. Juvenile spring chinook, which formed the basis for 1988 returns, would have traveled through Grays Harbor during a high population period for Caspian terns. However, spring chinook numbers fell below the 1981-1997 return run size average from 1990 to 1994. Tern numbers were still relatively high, although declining, when juvenile outmigrants that formed the basis for 1990-1994 adult returns would have passed

Table 4. Caspian tern and salmon terminal run size numbers for Grays Harbor, Washington.						
		Terminal Run Size - Salmon (thousands)				
	Caspian Tern	Chum	Spring	Fall		
Year	Grays Harbor (number of birds) ¹	Salmon ²	Chinook ³	Chinook ³	Coho ³	
1957	24					
1958	150					
1959-1971						
1972	3000					
1973	2000					
1974	2000-3000					
1975	2488					
1976	3680					
1977	4084					
1978	3712					
1979	4004					
1980	4394					
1981	4314		0.9	13.4	64.7	
1982	5216		0.7	14.6	81.7	
1983			0.9	9.9	54	
1984	5550		1.1	23.7	159.1	
1985			1.2	16.9	39.2	
1986			2	23.3	128	
1987	7180		1.1	34.6	89.4	
1988	5652	137	3.6	39.7	131.1	
1989	5848		2.4	56	113.3	
1990		12.6	1.6	39.8	118.3	
1991			1.5	33.2	289	
1992	2527		1.7	33.2	61.8	
1993	214		1.4	33.9	57.6	
1994	0		1.5	31	38.8	
1995	0		2.2	31.8	142.5	
1996	68		4.6	35.2	180.7	
1997			4.8	30.9	42.1	
1998						
1999						
1980-1991 ⁴		55.5				
1981-1997 ⁴			1.95	29.5	105.4	
¹ Caspian tern numbers from WDFW unpublished records. Breeding pair numbers/number of nests converted to number of birds.						
² 1992 Washington State Salmon and Steelhead Stock Inventory, Appendix Two, Coastal Stocks						
³ Pacific Fishery Management Council. Review of 1998 Ocean Salmon Fisheries.						
⁴ Average terminal run size.						

through Grays Harbor. Adult fall chinook runs exceeded the 1981-1997 average from 1987-1997, and even attained their highest return number in 1989. These high fall chinook runs occurred during a period when juvenile outmigrants would have encountered some of the highest tern populations. Coho returns fluctuated, exhibiting both high and low returns during the period when Caspian tern numbers in Grays Harbor were high (Table 4). In summary, there is no apparent relationship between Caspian tern breeding population size in Grays Harbor and returns of adult salmonids, suggesting that tern predation was not a limiting factor for adult returns.

Other impacts associated with Caspian tern reestablishment in Grays Harbor are relatively minor. Approximately 4 acres of estuarine island habitat would be converted to barren sand which would negligibly impact existing wildlife and wildlife habitat. Bald eagles and gull species would take advantage of increased prey (eggs, chicks, adults terns) reestablished in the estuary. There would be some increase in avian predation on Gray Harbor fisheries; however, based upon the information presented in Table 4, the reestablishment of Caspian terns in Grays Harbor would not devastate salmonid stocks. Healthy salmon runs would be expected to continue to occur. Significant impacts to commercial fisheries or commercial and subsistence fishing by area tribes in reserved Usual and Accustomed fishing areas are not expected. There should be no impacts to oyster farming or crab fisheries, since oysters and crabs are not a part of the terns expected diet.

Impacts of Pile Dike Modification. Double-crested cormorants are a relatively large bird. The presence of spike strips poses a danger of physical damage to their feet and lower bodies. Since the spikes are quite visible, it is anticipated that cormorants will avoid perching on the modified structures much as they would avoid natural features which pose a physical danger to them. Similarly, gulls, shorebirds, bald eagles, and peregrine falcons would be expected to avoid the spike strips. Additionally, king piles and end dolphins, the elevated perches where most bald eagle and/or peregrine perching would be expected, will not be modified with spike strips.

Pile dikes, except for king piles and end dolphins, typically are tidally inundated for short periods of time twice a day. Inundation may cover only the spreaders, which are located approximately 2 feet below the tops of the pilings or may cover the entire structure except for end dolphins and king piles. Current velocity during flood tide, when spreaders and piling tops would be covered, would be relatively low and probably oriented upstream. Current velocity, downstream, increases as the ebb tide progresses. The fastest current velocity during ebb tide at pile dikes is typically experienced after the pilings and spreaders are exposed. Potentially, a few juvenile salmonids could become stuck on the spike strips during ebb tide prior to the spreaders being exposed by the drop in water level. Double-crested cormorants were estimated to consume 4,540,200 juvenile salmon (4.7 percent of outmigrants that reached the estuary) in the Columbia River estuary in 1998 (Collis et al., 1999). The reduction in perching sites could result in reduction of smolt consumption by cormorants.

Impacts to Threatened and Endangered Species. The relocation of the Caspian tern colony from Rice Island to East Sand Island and Grays Harbor is expected to reduce tern predation on out-migrating Columbia and Snake River salmonid smolts, a portion of which consists of listed threatened and endangered species. Reduction in avian predation is expected to benefit these listed species, both wild and ESA-stocks from hatcheries. NMFS estimated that about 250,000 fish of listed stocks were taken by Caspian terns in 1997, and expected this number to increase to 1,600,000 in 1999 unless predation is reduced. Relocation of the tern colony is expected to substantially reduce predation of ESA stocks in the estuary in 2000.

This management plan for Caspian terns in 2000 could result in a 24-45 percent reduction in consumption of Columbia Basin smolts expected to reach the estuary. Reduction in juvenile salmonid predation is dependent on success in moving terns out of the Rice Island area expeditiously, the numbers of terns that are successfully attracted to restored colony sites outside the estuary, and the availability of alternate forage in the vicinity of East Sand Island.

This is the second step in a multi-year effort that is based on the premise that the most feasible approach to controlling where terns forage and what they feed on is through control of suitable nesting habitat. The available evidence indicates that Caspian tern nesting habitat is severely limited along the coast of the Pacific Northwest, and that the very large colony on Rice Island is at least partly a product of reduced availability of suitable habitat. By restoring previously used colony sites where terns relied less on juvenile salmonids as a food source, and by simultaneously reducing habitat availability in the Columbia River estuary, Caspian terns will shift their foraging to areas outside the estuary.

The step-wise approach to achieving the long-term management goal is crucial to the success of efforts to substantially and rapidly reduce losses of Columbia Basin salmonids to terns. Otherwise, there is increased risk of terns establishing new nesting areas that produce resource management conflicts as serious as the current colony on Rice Island.

Predictive models were developed by the Research Team (USGS, OSU, RTR) to describe expected smolt losses to terns under conditions of unlimited nesting habitat on East Sand Island vs. no habitat on East Sand Island. The models indicated that there would not be a significant difference in consumption of juvenile salmonids in 2000 under these two management options. This is because Caspian terns will continue to be attracted to Rice Island due to the 14-year history of nesting there, and that these terns, even if prevented from nesting, will continue to consume juvenile salmonids nearby. The models, however, predicted significant reductions in smolt losses, if suitable tern nesting habitat was provided nearby. This is because terns prevented from nesting on Rice Island are more likely to quickly relocate to another breeding site if that site is nearby and within their normal foraging range (i.e., East Sand Island). A general conclusion from the analysis was that uncertainty risks increased with decreasing area of nesting habitat provided on East Sand Island and with increasing distance to the nearest alternative colony site. The greatest reductions in smolt losses to terns in 2000 and the most predictable outcomes were achieved by providing sufficient nesting habitat for the entire tern population on East Sand Island, at least early in the nesting season, and providing an alternative, preferably nearby nesting site. In-season management of terns nesting on East Sand Island allows the Working Group to test several critical hypotheses regarding the behavior of terns dispersing from East Sand Island once habitat is restricted. If in-season management results in the emigration of more terns to restored colonies up the Washington coast, this will expedite reductions in smolt losses to terns in the Columbia River estuary.

Relocation of the colony would shift a prey resource from an area used by one or two territorial pairs of bald eagles to the territory of another pair. Prey resources around Rice Island are sufficient for bald eagles without the presence of nesting Caspian terns. Any necessary disturbing activities on Miller Sands Spit would be greater than 3,000 feet from either nest site and visually buffered by cottonwood stands, and should not disturb the eagles at the nest sites. Any nesting attempt by Caspian terns would likely be near the western end or on recently disposed material near the upstream end. Brief disturbance actions at these localized sites are not likely to adversely affect bald eagles nesting at Miller Sands Island or their foraging in the embayment at Miller Sands. Overall, activities associated with this project are not likely to adversely affect bald eagles.

Brown pelicans that loaf on East Sand Island would have migrated before habitat modification occurs. The relocation of a tern colony to the east end of East Sand Island would have no effect on brown pelicans. Research activity at East Sand Island would be more intensive than previous

efforts but research activities have to be discrete regardless to minimize potential for disturbance to colonial nesting birds. Thus actions implemented at East Sand Island are not likely to adversely affect brown pelicans. A site visit protocol and signage have been developed in consultation with USFWS to further protect brown pelicans.

Western snowy plovers, Oregon silverspot butterfly and *Howellia* do not occur in the immediate vicinity of any of the Oregon islands where project activities are slated. The proposed actions should have no effect on these listed species.

Impacts to listed species in Grays Harbor. Relocation of Caspian terns to the Grays Harbor area would provide additional prey for bald eagles in that area. Consumption by terns of coastal cutthroat trout is not expected since juveniles generally remain upstream. Bull trout are not expected to be affected. Juveniles are not generally found in the harbor. Sub-adults and adults are large (6 inches or more) and tend to be benthic, thus are not likely to be preyed upon by Caspian terns. Coho (a candidate species) populations have fluctuated widely historically, regardless of recorded tern nests. Reestablishment of a Caspian tern colony in Grays Harbor is not likely to adversely affect coho.

PROJECT COORDINATION

This project has been coordinated with Federal, State and Tribal agencies via the Caspian Tern Working Group (CTWG). This working group, established in May 1998, has met monthly to discuss resolution of this issue. There also has been interagency coordination since the Biological Opinion in 1995 required research on avian predation of listed salmonids. The draft Environmental Assessment for the 1999 pilot study was circulated for agency and public review on October 29, 1998. The EA and subsequent Finding of No Significant Impact also were made available on the Internet. A draft EA on the present action is being coordinated through a 30-day public and agency review. Comments are requested from:

U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
National Marine Fisheries Service
Columbia River Inter-Tribal Fish Commission
National Audubon Society
American Bird Conservancy
Pacific Seabird Group

Oregon
Department of Environmental Quality
Department of Fish and Wildlife
Department of Land Conservation and Development
Division of State Lands
Oregon State University
Clatsop County

Washington
Department of Ecology

Department of Fish and Wildlife
Department of Natural Resources
Grays Harbor County
Pacific County
City of Chinook
City of Aberdeen
City of Hoquiam
Sea Resources
Quinault Indian Nation

CONSULTATION REQUIREMENTS

a. Clean Water Act of 1977: Section 404 of the Clean Water Act will be complied with. No fill in waters of the U.S. is proposed.

b. Coastal Zone Management Act: The proposed action is within the Columbia River estuary. East Sand Island, Rice Island and Miller Sands Spit are designated Conservation shorelands in the Clatsop County Comprehensive Plan. Lands with this designation are to be managed for protection and maintenance of water quality, fish and wildlife habitat, water-dependent uses, economic resources, esthetic values and recreation. East Sand Island has two areas designated Priority 1 for dredged material disposal. Disposal site CC-S-6.8, on the upstream end of East Sand Island, is noted in the 1986 Dredged Material Management Plan prepared by CREST as having a nesting colony of Caspian terns and prefers this site not be revegetated after disposal activities. All of Rice Island is designated Priority 1 for disposal. The northeast corner of Rice Island is within the State of Washington, and Rice Island also contains a disposal location designation for Wahkiakum County, Washington. No actions are proposed for the Washington portion of Rice Island. All of Miller Sands Spit is designated Priority 1 for disposal. A Coastal Zone Consistency Determination was submitted to the Oregon Department of Land Conservation and Development (DLCD) for review for the 1999 EA. DLCD concurred with the Consistency Statement in correspondence dated December 15, 1998. DLCD will be advised of changes included in this FY 2000 plan.

Islands considered for modification to accommodate relocated Caspian terns are recently accreted lands owned by the State of Washington and managed by the Department of Natural Resources (DNR). The general zone around Goose and Sand Islands, part of the DNR's Scientific Preserves, is categorized as "Natural" environmental type under the Grays Harbor Estuary Management Plan. Whitcomb Flats is categorized as "Conservancy Natural". Cate Island is not part of the Scientific Preserve. The WDFW will coordinate the proposed action with Grays Harbor County as required by the State Shoreline Management Act.

c. Endangered Species Act of 1973, as amended: Listed or proposed threatened or endangered species are not likely to be adversely affected (brown pelican, bald eagle, peregrine falcon) or are not affected (western snowy plover, Oregon silverspot butterfly, *Howellia*) by the proposed actions. The threatened bald eagle nests and winters in the vicinity of East Sand Island, Rice Island and Miller Sands Spit. The brown pelican is a summer resident in and around East Sand Island. Western snowy plovers, Oregon silverspot butterfly and *Howellia* do not occur in the project area. The biological assessment (BA) prepared in 1999, with a finding of not likely to

adversely affect or no effect for listed species in the project vicinity, will be amended and submitted to USFWS for concurrence. Bald eagles roost and forage in Grays Harbor. The proposed action would increase the eagles' prey base. Bull trout would be unaffected.

Listed species of Columbia and Snake River salmonids are expected to benefit from the proposed action, and the Corps will amend the BA prepared in 1999 to that effect. Coastal cutthroat trout in Grays Harbor are not likely to be affected.

d. Fish and Wildlife Coordination Act: The proposed action is in compliance with the requirements of this act.

e. Migratory Bird Treaty Act of 1918, as amended. This act prohibits the taking of migratory birds except as permitted through certain regulations. These regulations (50 CFR 21) authorize the taking of migratory birds through establishment of hunting seasons and issuance of various permits. Permits may be issued for "depredation control purposes," including reducing damage to public property. Permits may be issued to wildlife management authorities for the purpose of protecting State and Federal listed plants or animals, or species of management concern from predation or competition at levels documented to jeopardize the recovery of stability of such species. Permits are not required to scare or herd depredating migratory birds, unless such hazing results in the abandonment of active nests, or the loss of eggs, nestlings or adults.

The United States Government continues to be bound by the international agreements (four bilateral Migratory Bird Conventions) to protect migratory birds. The USFWS continues to informally consult with other Federal agencies, to ensure those agencies conduct Federal actions in a manner that complies with the obligations of the Government under the various Migratory Bird Conventions.

e. Marine Protection, Research, and Sanctuaries Act of 1972, as amended: No marine resources covered under this Act would be affected by the proposed action.

f. Cultural Resources Acts: No cultural resources would be affected by activity at this location due to the extent of past disturbance. Historical resources (remnants of WW II military action) on East Sand Island located in the project area have been buried under dredged material and would be unaffected by removal of vegetation and surface soil. The Oregon and Washington State Historic Preservation Offices have been advised of activity in the area.

g. Executive Order 11988, Flood Plain Management, 24 May 1977: No flood plains would be affected by the proposed action.

h. Executive Order 11990, Protection of Wetlands: No wetlands would be affected by the proposed action.

i. Analysis of Impacts on Prime and Unique Farmlands: Not applicable.

j. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Resource conservation and Recovery Act (RCRA). No hazardous, toxic and radioactive waste (HTRW) concerns have been identified.

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